

**Georg-August-Universität Göttingen**  
**Fakultät für Geowissenschaften und Geographie**

Studiengang: Geographie: Ressourcenanalyse und-management

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**“Smallholder perceptions of sustainability  
criteria related to forest and peatland  
restoration”**

**Masterarbeit**

zur Erlangung des Grades eines

Master of Science

Vorgelegt von

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Göttingen, Januar 2020

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## Acknowledgements

First and foremost, I would like to take this opportunity to thank my supervisor Prof. Dr. Heiko Faust for the support and the trust to let me conduct my own research in Indonesia and be a part of the CRC 990 subgroup C02. My appreciation goes to the DFG whose financing of the project made my field studies possible.

Further, my gratitude goes to the Counterparts and people in Jambi for supporting me all the way and helping out whenever I needed help with anything. This is especially true for the whole of the Jambi office crew and my magnificent research assistant Amrina, who not just assisted me in navigating the new seas of Indonesian culture but was also a friend throughout my whole stay and beyond.

Personally, I am thankful for my family who never doubted me in my academic pursuits and supported me throughout my studies. Stefan Grahn, Silke, Ingrid and Egon Knieling as well as my sister Swantje, thank you for everything.

Lastly, I would like to thank my partner, Sabine, for all the academical encouragement, proof-reading and motivation since my Bachelors thesis. This would not have been possible without you.

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## Abstract

The Island of Sumatra, Indonesia is home to vast areas of tropical peatland, which play a substantial role as carbon sinks if left in their natural state but become carbon emitters when disturbed by drainage or fire.

After extensive fires in 2015, the Indonesian government founded the Peatland restoration Agency (BRG) aiming to mitigate and prevent fires on the ecologically highly important peatlands of Sumatra and Kalimantan. In doing so, the program's goal was not just to rewet and revegetate barren peatlands but to educate smallholder-farmers and offer alternative methods of income by promoting different forms of sustainable peatland management.

This thesis investigates how perspectives towards sustainable peatland management may have changed due to the efforts of the BRG and tries to offer a framework for further studies. Additionally, the "Sustainability Assessment of Food and Agriculture systems" (SAFA) provided by the Food and Agriculture Organization of the United Nations was used to triangulate the interview results with sustainability practices of smallholder-farmers in rural Jambi.

The findings show, that perception towards peatland are predominantly economically and smallholders do not perceive peatlands as a fragile ecosystem worth protecting, but as a possible source of income. The SAFA results are congruent with the interviews indicating no practice-perception-gap but overall small interest in sustainability issues. During the field work the role of 'change agents' and the concept of sustainability transitions moved more into research focus. This thesis aims to contribute further to the field of sustainability transitions, smallholder perceptions and the role of 'change agents' in the Province of Jambi, Indonesia proposing further research within a framework of Multi-Level-Perspective and political ecology.

“Smallholder perceptions of sustainability criteria related to forest and peatland restoration”  
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## Abbreviations

Mha	-----	Megahectares
%	-----	Percentage
°C	-----	Grad Celsius
Gt	-----	Gigatonnes
ENSO	-----	El Nino Southern Oscillation
DPG <i>Desa Peduli Gambut</i>	-----	Peatland Care Village
(F.l.t.r.)	-----	from left to right
VSS	-----	Voluntary Sustainability Standards
MMA	-----	Mixed Method Approach
UNCTAD	-----	United Nations Conference on Trade and Development
FAO	-----	Food and Agriculture Organization of the United Nations
MLP	-----	Multi-Level-Perspective

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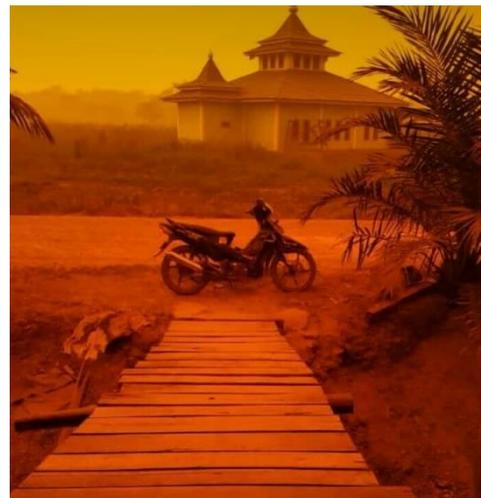
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# Introduction

When in 2019 the rain failed to appear in late August, it became apparent that now would be the proving ground for a just 3 years ago implemented Peatland Restoration Agency (BRG). The sustained drought seemed to make the danger vast fires on the easily flammable and hard to extinguish peatlands of Sumatra just too real. It was the time to see if the work of the BRG had paid off or if the fires would again, just as they did in 1997 and 2015, be devastating and long-lasting.

When the fires reached their maximum in mid-September, haze became so bad, pictures of a reddish sky made the rounds throughout social media and news outlets around the world (see Paddock & Suhartono, 2019; Lamb, 2019; Freedman, 2019 among others). Was the work the Indonesian government put in fire prevention all in vain? According to Arief Wijaya, member of the “World Resources Institute” in Jakarta, the countermeasures had “some positive results” and considerably limited the impacts of this year’s fire-season (Normile, 2019, p. 18). It was the first year, the



*Figure 1* The haze induced by the fires in Jambi 2019 makes the sky appear red. Photo taken by The Research Assistant Amrina 2019

measures to prevent fires on peatland came to a test since the devastating fires of 2015. This year, the Indian Ocean Dipole (IOD) provided ideal conditions making the dry season dryer and longer than the years after 2015. When the fires happened, haze hazardous levels in some of Sumatra’s provinces, forcing schools to close and airports to cancel flights. Although the recent ‘test’ of the fire prevention attempts went well according to BRG officials, the critics of the program lament a lack of rigor when it comes to on-ground measures and a multitude of legal loopholes and bureaucratic scrambles about jurisdictions (Ibid.).

The damaging of the environment in the form of forest fires, illegal logging and mining activities in the province of Jambi alone will cost the Province an estimated 1.2 billion US\$, according to the Warsi Indonesian Conservation Community throughout this year, there have been 30,947 hot spots recorded across 157,137 ha within the province. Over 60 % of these hotspot were recorded on peatland, 25 % reached a depth of more than 4 meters making a revegetation costly and complicated (Afrizal, 2019).

In the following chapters, this thesis aims to triangulate perceptions on the importance of peatland regulation and fire protection with the intent to find success-stories and room for improvement within the field of sustainable peatland management. This exploratory study uses the framing of sustainability criteria with the aid of the “sustainability Assessment of Food and Agriculture (SAFA) to conduct a field study in the Province of Jambi, Sumatra.

### 1.1 The Peatland Story

Peatlands are wetlands in which permanently water-bearing conditions prevent the complete degradation of dead plant material. Peatlands have accumulated thick layers of carbon-rich peat over thousands of years. Peatlands therefore contain a disproportionate amount of carbon: seven times more per hectare in the boreal zone and ten times more per hectare in the tropics than ecosystems on mineral soils. Peatlands are the most space-saving reserves of organic carbon on the planet: Although they cover only 3% of the global territory, they contain more carbon than the entire forest biomass of the planet. (Joosten, 2015, p. 4) These organic soils are very rich in organic components, often consisting to 90% of organic matter (Leifeld & Menichetti, 2018, p. 2). In lowlands, topogen (relief-formed) peat is formed under the influence of water saturation. Following the initial phase, litter accumulation from plants results -over the span of thousands of years- in dome-shaped ombrogen (rain-fed) peats. Peatlands a flat topography to develop (Ibid.). They can be found in all climates (even though oceanic climates only contribute 0,1 MHa) in strongly varying quantities. Globally speaking, most peatlands can be found in the Boreal climate, where they make u 360.9 Mha. The tropical peatlands are the second largest contributor with 58.7 Mha. As of 2018, human activity is draining or mining about 10% of the global peatlands. (Leifeld & Menichetti, 2018, p. 3) The human disturbance causes the peat to shift from a carbon sink, where C from the atmosphere is bound by means of photosynthesizing organic mass, to a carbon source. Leifeld and Manichetti (2018) speak of three possible C-loss paths: “*CO<sub>2</sub> from microbial peat oxidation, dissolved C leaching, and CO<sub>2</sub>, CO and CH<sub>4</sub> from peat fires and combustion of mined peat*”

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Additionally, drained peatlands release vast amounts of N<sub>2</sub>O, further contributing to the global greenhouse gas emissions (Leifeld & Menichetti, 2018, p. 2).

Even if smaller in size, peatlands have the considerable advantage of being better for restoration since they are less nitrogen costly (3.4 times) and involve much less land than the restoration of mineral soils (Leifeld & Menichetti, 2018, p. 4). Most of utilized peatlands are to be found in tropical climates, often managed in high intensity. Since the area, compared to mineral soil, is relatively small losses on peat could be compensated by rising productivity on mineral soils. The concept of peatland adjusted agriculture, paludiculture, could allow for a non-invasive land use (Ibid. 5).

### 1.1.1 Tropical Peatlands

Around half of the global tropical peatlands (25 Mha) are located in south-East-Asia (56%), most of which can be found in Indonesia and Malaysia. Here, peatlands often develop an impressive thickness with a mean thickness of more than 5 meters, hence contributing with 77% to the entire tropical peatland storage (Hooijer et al., 2012, p. 1053). Indonesia's tropical peatlands make up 36% of the world's total and hold about 28.1 Gt of carbon (Normile, 2019, p. 18).

Owing to the difficult working condition due to its wetness as well as its low agricultural potential and the abundance of mineral soils, development of peatlands for agriculture rarely occurred until the 1980's (Miettinen, Shi, & Liew, 2016, p. 67). If left undisturbed, peatlands have substantial potential as a carbon deposit, storing around 69 Gt in the SE Asian Region (Miettinen et al., 2016, p. 68). Additionally, peatlands offers a habitat for highly specialized flora and fauna, often endemic to the region and play an important role in the overall hydrology of the region (Ibid.) Due to rising global demand on tropical commodities, primarily Oil Palm and Rubber (Rajendra Jadhav, 2019) available mineral land has become a scarce resource in SE Asian countries such as Indonesia and Malaysia. In recent years, drainage and deforestation of tropical peatlands has become a common phenomenon and generated a whole field of new challenges. The 1997-98 fires caused by a particularly devastating El Niño Southern Oscillation (ENSO) led to a number of peatland related problems. Drained peat is prone to burn and due to the nature of the fires, which occur subterranean in the barely decomposed layers, hard to put out once ignited. Most of the peatlands damaged by the 1997/98 fire remained degraded, due to very slow accumulation rate of approx. 1 mm/year. Natural regeneration which combined with other factors ultimately led to high peat oxidation, turning

peat from a carbon sink into a carbon source, directly affecting global climate change (Miettinen et al., 2016, p. 68). The degradation of peatlands has increased carbon leaching from soils by 200%. Cause of this increase are drainage, contributing to the problem with 38 % and the regrowth of secondary vegetation with foliage that consists of more labile organic carbon, which is hindering the accumulation and ultimately storage of carbon within the peatland (62 %) (Wit, Rixen, Baum, Pranowo, & Hutahaean, 2018, p. 1). Overall, a total of  $5.2 \pm 0.3$  million hectares land were burned during the fire event, affecting recently logged fires most (Siegert, Ruecker, Hinrichs, & Hoffmann, 2001, p. 437). Even in the unlikely event that no further areas will be exploited, drained peatlands will release 80.8 Gt carbon and 2.3 Gt of nitrogen globally. With peatland restoration, 1.91 Gt. of annual greenhouse gas emissions could be prevented. The restoration of peatlands would be far less costly and needs less land than mineral soil carbon sequestration (Leifeld & Menichetti, 2018, p. 1).

### 1.1.2 The Peatlands of Sumatra

Tropical peatlands in Sumatra cover about 16% of its land mass equaling to 72,431 km<sup>2</sup> with thickness of the peat varying from 2 to 10 meters. The peatlands are mostly located on the lowlands on the eastern coast (Wit et al., 2018, p. 2) following the river systems further inland, were some bigger peat domes can be found. Most of these peatlands are considered to be disturbed as a result of drainage and deforestation, which was conducted to make room for agricultural cropland, mostly oil palm (Wit et al., 2018, p. 2). With only 6 percent of the remaining peatlands considered to be pristine in the whole of SE the topic attracted interest of scholars worldwide. More than 80 % of peats are located in lowlands. There are two kinds of peat to be found, tidal dependent coastal peats and *Lebak* swamps, which can be found further inland (Armanto, Wildayana, Imanudin, Junedi, & Zuhdi, 2017, p. 14). Peats can be divided into three zones, I,II, III. From saltwater to freshwater with tidal influence to *lebak*, influenced by seasonal flooding along floodplains of river systems. This work will exclusively thematize zone III peats, since these were the dominant peat form along the *Sungai Kumpeh* river, were field work was conducted.

While Sumatra-specific numbers are not available, Miettinen et al (2017) found that emissions from Peninsular Malaysia, Sumatra and Borneo were intensified due to extensive land cover changes since 1990. 44 % of the emissions came from industrial plantations, 36.6 % from smallholder areas (Miettinen, Hooijer, Vernimmen, Liew, & Page, 2017). 78 % of all emissions are coming from managed land-cover types and while there are big uncertainties due to contradictory peatland extents in official data, the authors urging for rapid measures to mitigate GHG emissions from peat (Ibid.1). Hartill et al (2017) found that peat forest conversion to oil

palm plantation is inevitably connected to a rise of N<sub>2</sub>O emissions and subsequently negative impact on climate change (Hartill, Hergoualc'h, Comeau, Jo, & Lou, 2017).

### 1.1.3 The 2015 and 2019 fires

The 2015 fires were the worst since the ENSO event 1997/98. Between June and October 2015 around 2.61 million ha were affected of which almost 619.000 were peatlands (Tacconi, 2016, 641). More than half a million people suffered from health effects, mostly respiratory problems. Jambi Province was severely affected, having 123.000 ha burned. The resulting haze brought political problems with the neighboring countries of Malaysia and Singapore, air traffic in the region as well as most of public life came to a halt, affecting the whole of SE Asia (Ibid.).

The fires were, unlike to the events in 1997/98, a combined result of an El Niño in the western Pacific Ocean and the irregular occurring Indian Ocean dipole that had a prolonged and intensified dry season as an effect. The fires burned from late June until late October, the directly affected area exceeded 2.6 million ha, haze effects were noticeable as far as Thailand and the Philippines (Normile, 2019, p. 18).

Wösten et al (2006) state that fire damage on tropical peatlands leads to an increased area of floods of more than 1.5 m and subsequently to threatened livelihoods due to limited agriculture and plantation possibilities (Ibid. 243).

While studying the *Air Hitam Laut* catchment area SE of the *Sungai Kumpeh*, the numerous human-induced changes in land use lead to lowered groundwater and peat surface levels. The direct consequences of this are increased risk of flood in the wet season, poor water quality all year round and an increased fire susceptibility during dry seasons (Ibid.).

Despite the fact that this year's fires did not reach the devastating effects of the ones of 2015, they had far-reaching effects within the Island of Sumatra and especially in the provinces of Jambi and its neighbor Riau, where fires were especially fierce.

Numerous people had to seek medical attention and schools were closed during the strongest haze from mid-September – mid October. As of now, 249 arrests have been made in connection to the fires (Afrizal B, 2019).



Figure 2 Screenshot of a Air Quality Monitoring Website during the 2019 fire event. Photo taken by the author, 2019

## 1.2 The Peatland Restoration Agency- Badan Restorasi Gambut (BRG)

Motivated by the 2015 fires and rising international pressure from adjacent states, the social democratic PDI.P party with its president Joko Widodo was forced to provide for quick improvement of the situation.



Figure 3 Logo of the peatland restoration

Hence, the Peatland Restoration Agency, *Badan Restorasi Gambut* (BRG) was founded. Its aim is to mitigate risks of re-occurring fires on peatland-ecosystems. "It was established by virtue of the Presidential regulation No.1 of 2016 on the Peatland Restoration Agency, which was signed by president Widodo on 6 January 2016. BRG operates under and reports to the President." (BRG, 2019, p. 2). It is tasked with coordination and facilitation of peatland restoration in seven "priority provinces": Jambi, Riau, South Sumatra, West Kalimantan, Central Kalimantan, South Kalimantan and Papua. It's targeting 2.4 million ha to be restored by December 2020 (Ibid.) The possibility to prolong the runtime of the program exists.

A 2018 published estimate by (Hansson & Dargusch, 2018) predicts an overall cost of well over 4.6 billion US\$ for the completion of the 2.5 million ha restoration goal. In 2016, the Norwegian government agreed to support the Indonesian government with 4.3 million US\$, making the country the biggest single supporter of the BRG. Additionally, other European countries, including Germany assisted with 134.6 Million US\$. The Indonesian government itself contributed 64.8 million US\$ to the Agency (Ibid. p. 7). How the gap between estimated costs and available funding will be bridged is yet to be announced.

The BRG is given 9 functions:

(1) Strengthening of the peatland restoration policies; (2) Planning, controlling & collaborating on peatland restoration; (3) Mapping out of the peatland hydrological units (KHGs); (4) Establishing the protection and cultivation zones; (5) Constructing peat rewetting infrastructure and its supporting devices; (6) Restructuring the burn scar areas; (7) Disseminating information and organizing education activities on peatland restoration; (8) Overseeing the activities of construction, operation, and maintenance within the concession areas; (9) other functions given by the President: (Ibid. 3).

Collaborations with NGOs or other government agency are possible. The parties responsible for the implementation of the peatland restoration are the regional permit holders/concessionaires of forest land working within areas to be restored.

## 1.2 The Peatland Restoration Agency- Badan Restorasi Gambut (BRG)

As seen **Fig. 4** Jambi Province is home to vast areas of peatland and even though most of it remains under licensed cultivation, 76,798 ha remain unlicensed and are of interest for this study, since smallhold-farmers are most common on these lands (ibid. 6).

The long-term goal of the agency is to establish a foundation within it 2016 – 2020 timeframe on which broader and systematic re vitalization of peatlands can be done (ibid. 11).

There are two approaches towards peatland management: first, quick response (carried out 2016 – 2018), which is meant to rewet drained peatlands and “community empowerment to reduce the risk of fire” and “comprehensive systematic approach” (mainly designed for long-term management from 2020 onwards) (ibid. 13). In the research focus of this work, the long term approach is of special interest,

since it should be integrated within the village development plans at district/city/ province level and aims not just at the physical management of peatlands but on educational measures and initiating a process of perception change within the local (smallholder) communities.

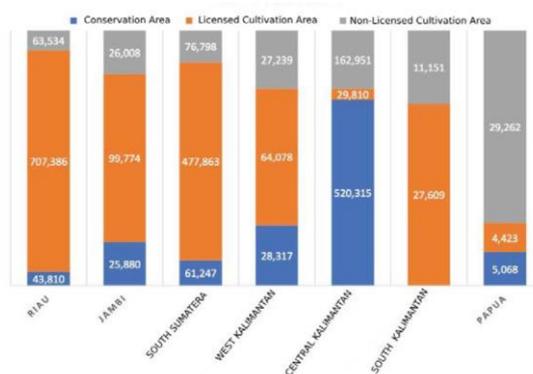


Figure 4 Area size and distribution of restoration endeavors in seven priority provinces. Source (BRG)

At the heart of the BRG is the “3R” program. It is designed to manage and restore the peatlands and to ensure the effects may be long lasting. Therefore, a participatory approach was chosen, to promote sustainable peatland management to communities in affected regions. The 3R are:

1. Rewetting: a measurement with observable short-term-effect, the aim is to raise the water level in drained peatlands to a water-level of 40 cm below ground, to minimize soil subsidence and the risk of fires within the soils. Applied techniques are canal-blocking (mostly simple wooden/earthen dams with a spillway to allow boats with low draught to pass through) canal-backfilling (partial filling of canals to allow the remaining water to move into the soil) and deep-well-drilling (to retain soil moisture during the dry season and water source for the fight against fires).



Figure 5 Building of a canal block to retain soil moisture in Seponjen, Jambi Province. Picture taken by the Author 2019

2. Revegetation: Degraded peatlands, especially after fires are targeted with the help of planting of seedlings and aided succession.

3. Revitalization: There are three approaches, land-based (promotion of Paludiculture with e.g. Sago Palm), water-based (aquaculture, fisheries) and Environmental service based (Ecotourism) (Alue Dohong, 2017).

Paludiculture can be defined as a “swamp cultivation approach developed in northern temperate areas as a means of rehabilitating degraded peatland, while making these economically useful at the same time” (Wim Giesen & Eli Nirmala, 2018, p. 28).

In this work, the “third R”, the Revitalization of local livelihoods is in the center of attention and shall be explained in further detail. It aims towards ensuring that local communities are imbued with improved livelihoods due to the introduction of alternative means of income generation (Ibid. 47).

Traditionally, rural communities in peatlands have drawn livelihoods from peatland for centuries, mostly by low-impact extraction of naturally occurring (read: not planted) non-timber-forest-products such as *Rattan* or *Jelutong* rubber collection. Since extensive drainage happened due to the ongoing oil palm boom, the communities were confronted with the consequences of the unsustainable practices, namely soil subsidence and fires.

According to Wim Giesen & Eli Nirmala, 2018 smallholders urge for new alternatives, especially since revenues from flooded oil palm holdings are declining (Ibid. 48).

Problematic within this approach are the lack of determination towards environmental sustainability, as the BRG and others promote crops, which seek a middle ground between generating a decent income and are better adapted to peatlands (Ibid. 49.).

Between 2016 and 2017 75 villages nationwide and 10 villages in Jambi Province did become Peatland Care Villages, *Desa Peduli Gambut* (DPK). With the assignment of this status they received aids in form of workshops and financial/material funding. Central topics were the sustainable management of local commodities and diversification. The overall goal of this program is to promote peat-friendly management practices and alternatives to disruptive monocultures such as Oil Palm.

A case study conducted in the neighboring Province of Riau to examine the effects of diversified economic activities in peatland communities. It's findings were, that there is a high possibility of mitigating peatland fires through “strengthening empowerment, participation and market certainty” (Antriyandarti et al.) to apply for partaking in the revitalization program and,

if chosen, took part in workshops, were visited by BRG facilitators and received financial and material aids in form of livestock and/or crops.

A stakeholder perception survey, conducted by the BRG with 3800 respondents nationwide concluded that the restorations activities had been implemented well and gave the Jambi Province a Good result towards peatland restoration perception. **Fig. 6** shows the detailed results, indicating a positive perception towards peatland restoration in all provinces surveyed.

### 1.3 Problem Formulation and Research Goal

As Lund puts it in his 2014 publication “Of what is This a Case?”, A case study is always “a chunk of empirical reality where certain features marked out, emphasized and privileged” (Ibid. 224) while other aspects of the topic must take a stand back. The framing of the research is therefore a crucial step towards the generation of knowledge and shall be lined out in detail below.

As shown above, Indonesia stands at a pathway between more extensive agriculture with the risk of environmental catastrophes and a step toward sustainable (peat)land management. This thesis will add to an existing body of literature towards sustainability issues, trying to find a new angle upon this topic and in part, trying to contribute to the long-neglected corpus of perceptual geography. The purpose of this section is to outline the research question and clarify the aim of the thesis.

As the introduction pointed out, the country of Indonesia is in a dire need for a change of practices and perceptions on peatland cultivation. The first central question in this thesis is, **to what extent did the work of revitalization of local livelihoods contribute to a perception change on actor-level within peatland restoration villages?**

And secondly, **can a difference in practice regarding four dimensions of sustainability be found between restoration and non-restoration villages?**

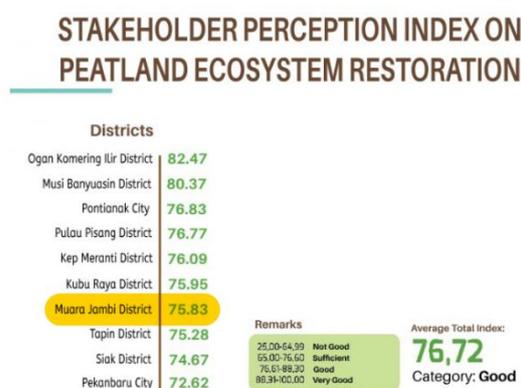


Figure 6 Stakeholder perception Index on peatland ecosystem restoration. Source: (BRG, 2017, p. 30) (Highlighted by the Author)

## 1.3.1 Political Ecology

This case study is to be understood as an exploratory research approach, which was guaranteed by the use of open-ended questions during the qualitative interviews, participatory observation and a general openness towards factors that emerged during the field stay, one elementary goal was to use the SAFA toolkit in a real-life environment to thoroughly test it for further studies. Therefore, this work is neither theory-led nor subject to a fixed conceptual framework, the prevailing school of thought of the author allocated himself within the field of political ecology. This section shall explain the basic concept and demonstrate the extent to which this work is based on this strain of thought.

Political ecology is applied, when topics dwell in between the realms of politics and environment since it not just accepts but aims to bring out the deeply intertwined codependences between these two topics. Established in the English-speaking world in the 1980s by authors like Piers Blaikie (e.g. (Blaikie, 2016)). Since then, building on varying epistemological points of view (beginning predominantly Marxist but later fanning out to post-structuralist, critical realist or social constructivist approaches (Hein, 2019, p. 12). According to Blaikie (2007), it has been created from a history of “wide ranging work of different disciplines, cultural settings and epistemological foundations” (Blaikie, 2008, p. 765).

Arguing that nature is produced through practices as well as inherent physical processes, this thesis aims to incorporate both dimensions by providing an extensive overview on peatlands and its importance within global GHG emissions and the evaluation of case studies to address both, nature and the social sphere. This ontology applies well to the conducted research frame, since:

“The social practices of smallholders, conservationists and logging companies transform the meanings of nature but at the same time they transform the biophysical materiality of nature. The biophysical materiality of nature is rather shaped by social practices and discourses than determined by its materiality” (Hein, 2019, p. 12). Depending to one’s position within the social realm, perception towards nature change, valorizing different aspects of ecosystem services.

Blaikie (2007) sees environmental change as a product of political progress and Robbins seems almost like a direct logical heir when he claims that research tends to reveal winners and losers, hidden costs and underlying power relations (Robbins 2004 in: Beckert, 2017, p. 9). Political ecology, following the initial line of thought, Blaikie defines political ecology with three assumptions: firstly, poverty can induce environmental degradation, which then may further deepen poverty. Secondly, due to the complex topic there is a call for multi layered analysis and third: external structure frame land management (Beckert, 2017, p. 9).

Although political ecology has received some criticism over the years due to its broad concept, lack of theoretical consistency, and “charges of incoherence” (Blaikie, 2008, p. 765), it remains a relevant underlying way to observe and examine cases concerning nature-societal relations.

### 1.3.2 Perceptions and Geography

Further approaching the thematic of sustainability assessments it becomes apparent that this case study needs to evaluate the perceptions of the affected actors, to be able to fully understand the ongoing processes. Perceptual geography had its fair share of attention in the 1950s, propagating an inclusion of the spatial level in the often-clinical investigation of perceptions which only tended to neglect non-human environment all together (Warf, 2010). It has developed since then and found practical applications in the concept of mental maps for example. However, this work is not in the ranks of the work on perceptual geography, but understands the element of perception as an element to be researched in the collection of actor-related case studies. Geographical perception studies have been classified in different ways (see Wood, 1970, p. 130) to fit the idea of perceptions into a geographical framework.

This work can be classified as a work on environmental perception “- man’s awareness of the features of the immediate environment” (Ibid. 131).

Perception will be defined here as the way in which something is regarded, understood, or interpreted by a person (Cambridge) In this sense, ones understanding of nature and its importance and worth of protection will be in the research focus. Sustainability perception is understood here, as “humans awareness of the environment” (Vincenzi et al., 2018, p. 1369). It is a psychosocial phenomenon, in cooperating affective- (e.g. feelings towards the environment) as well as cognitive (e.g. procedures of processing information within an actor) processes. They can be observed with a collective or individual in mind (Pinheiro 1997 in (Vincenzi et al., 2018). Perceptions shape the surrounding physical world, since “Cognitive rules, shared beliefs and expectations steer the perception of the actors towards the future and guide action in the present” (Vogel et al., 2020, p. 2). On that basis, it is assumed, that changes within a ‘socio-material world’ as the landscape of peatland smallhold-farmers in Jambi, will not just happen if it is ordered by the authorities (e.g. the BRG Agency, promoting sustainable peatland practices) but will always be influenced by actors and their perceptions. Actors have, according to (Rotmans, Kemp, & van Asselt, 2001) the ability to block or advance transitions towards more sustainable scenarios (Ibid. 25). It is therefore crucial to assess perceptions within a case study to thoroughly understand the obstacles and accelerators of change. The methods of assessing perceptions are further elaborated in section 2 of this thesis.

## 1.4 Case-Study Area

The Indonesian Island of Sumatra is with an area of 473.481 km<sup>2</sup> world's fifth and Indonesia's third largest island (Kunz et al., 2019, p. 115). It has ten provinces that stretch about 1700 km from northwest to southeast and a maximum width of 370 km.

Situated below the Equator lies the Jambi province, spreading over 51000 km<sup>2</sup> (Afriyanti, Hein, Kroeze, Zuhdi, & Saad, 2019, p. 2) between the mountainous west with Sumatra's highest Mountain (*Gunung Kerinci*, 3805m) as part of the *Barisan* Mountain Range to the eastern lowland regions in which the Case Study Area lies. It borders the provinces of Riau(north) the South China Sea (east) the Province of South Sumatra (south) and Bengkulu in the west (Ibid.). Between 1985 and 2007 1.7 million ha of forest have been cleared and mostly turned into commodity plantations such as rubber or oil palm.

Of 71 % rain forest cover in 1985, only 30 % remain, most of which in the mountain ranges in west-Jambi (Drescher et al 2016 in (Kunz et al., 2019, p. 115).

**Fig. 7** shows the change of land use within the *Tembesi* watershed in the western part of the province. Here, the drastic changes within the provinces land use patterns become evident, as wetlands (including peatlands) have grand areas of their forests, most of it to oil palm Plantations. The data for the LU analysis, obtained by the CRC 990, suggests similar patterns for the rest of Jambi province. Notably, the cultivation of oil palm has risen significantly over the 23-year time span, indicating dramatic changes within the landscape.

2017, Jambi had approx. 3.5 million inhabitants, living in 11 districts (Afriyanti et al., 2019, p. 2) (Badan Pusat Statistik Jambi 2015 in: (Kunz et al., 2019, p. 115). Oil Palm Cultivation was

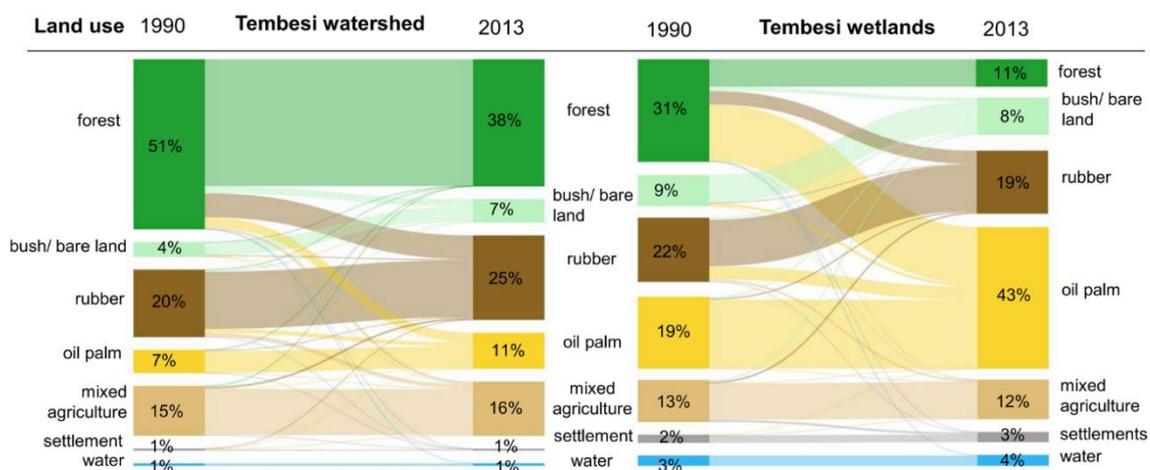


Figure 7 Vizualization of Land use change within the province of Jambi. Source: Mertens et al in review

introduced to Jambi via large companies and adopted by smallhold-farmer in the in the

### 1.4.1 The Agricultural Sector in Jambi Province

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1980s/1990s. While it used to be subsidized by the Government, nowadays many smallholders work completely independent. A large section of the Jambi agricultural sector is inhabitant by plasma farmer and plantation worker, often having a transmigration. Around 200.000 households in Jambi are involved in oil palm cultivation, positioning Jambi at 6<sup>th</sup> place compared to all other Indonesian provinces. The estimated area for crude palm oil production exceeded 700.000 ha in 2012 (Kubitza, Krishna, Alamsyah, & Qaim, 2018, p. 108).

The villages for the case study were selected with the help of the Indonesian counterparts at UNJA and the official Peatland restoration Villages -*Desa Peduli Gambut*- lists provided by the Peatland restoration Agency.

In total, 7 villages were visited. All villages except one were within the catchment area of the *Sungai Kumpeh*, following the river from Jambi City to its confluence into the *Batang hari*. The research sites lie within *Muaro Jambi District* in the *Jambi Province*. The furthest village was *Gedong Karya* about 85 km from Jambi City, which equaled to about 4 hours of driving time in the dry season. Closest to Jambi was *Arang-Arang*, which was approx. 30 km away.

The climate in the study area is tropical humid with 2235 mm rainfall and average temperatures of 27°C (climate-data.org). An exception to this climate makes the relatively dry season from July – September where temperatures rise reaching their maximum in September and rainfall is reduced to average 120 mm/month.

Thanks to the generous provision of village related data -*profil desa*- by the local village heads or their administrative clerks, information could be gathered for *Sogo*, *Sungai Bungur*, *Pulau Mentaro*, *Mekar Sari*, *Pematang Rahim* and *Seponjen*. The original language of the reports is in *Bahasa Indonesia*, translations were made by the author. In the other villages it was not possible to obtain profiles as the respective authorities were not in a position to provide them.

### 1.4.1 The Agricultural Sector in Jambi Province

Particularly affected from the fires is the agricultural sector, which contributes with 14.33 % to the Indonesian GDP. Sumatra, lagging behind the other islands of the archipelago, almost halving the per capita income between 1970 and 2010 due to the end of the oil boom, is still heavily dependent on its agricultural sector. In 2010, almost 50 % of the overall workforce worked within the sector, 43 % of the production of palm oil and 60 % of the rubber production are done by smallhold-farmers. The agricultural GDP remained somewhat stable and accounts for 25 % of the regional GDP (Pinilla & Willebald, 2018, p. 295).

Indonesia and Malaysia produce a combined 85 % of the world-wide palm oil and approximately 30 % of the world-wide traded rubber. concerning palm oil, companies produce

about 60 %, smallholder 40 %, mirroring the global ratio. In rubber production, smallholder account for almost 80 % of the total production (Kunz et al., 2019, p. 115).

Large monocultures in SE Asia, often oil palm, have been proven to be a key driver of deforestation and conversion of peat swamps (Kubitza et al., 2018, p. 107). Despite a whole generation of scholars reporting negative environmental effects, the expanse of areas designated mostly for oil palm continues to this day due to an ever-rising global demand for vegetable oil (Ibid.).

Palm oil has been linked to increased household consumption, especially non-food-expenditures, indicating a positive effect in local livelihoods. Compared to food crops such as rice-paddies and cash crops such as rubber, Palm Oil is less labor intensive, giving smallholder-farmers the opportunity of diversifying and increasing their income by finding additional sources of income in the time not working on the field (Kubitza et al., 2018, p. 114).

**Fig. 8** depicts the villages visited with the number of interviews conducted and classified as DPG or non-DPG village.

1.4.1 The Agricultural Sector in Jambi Province

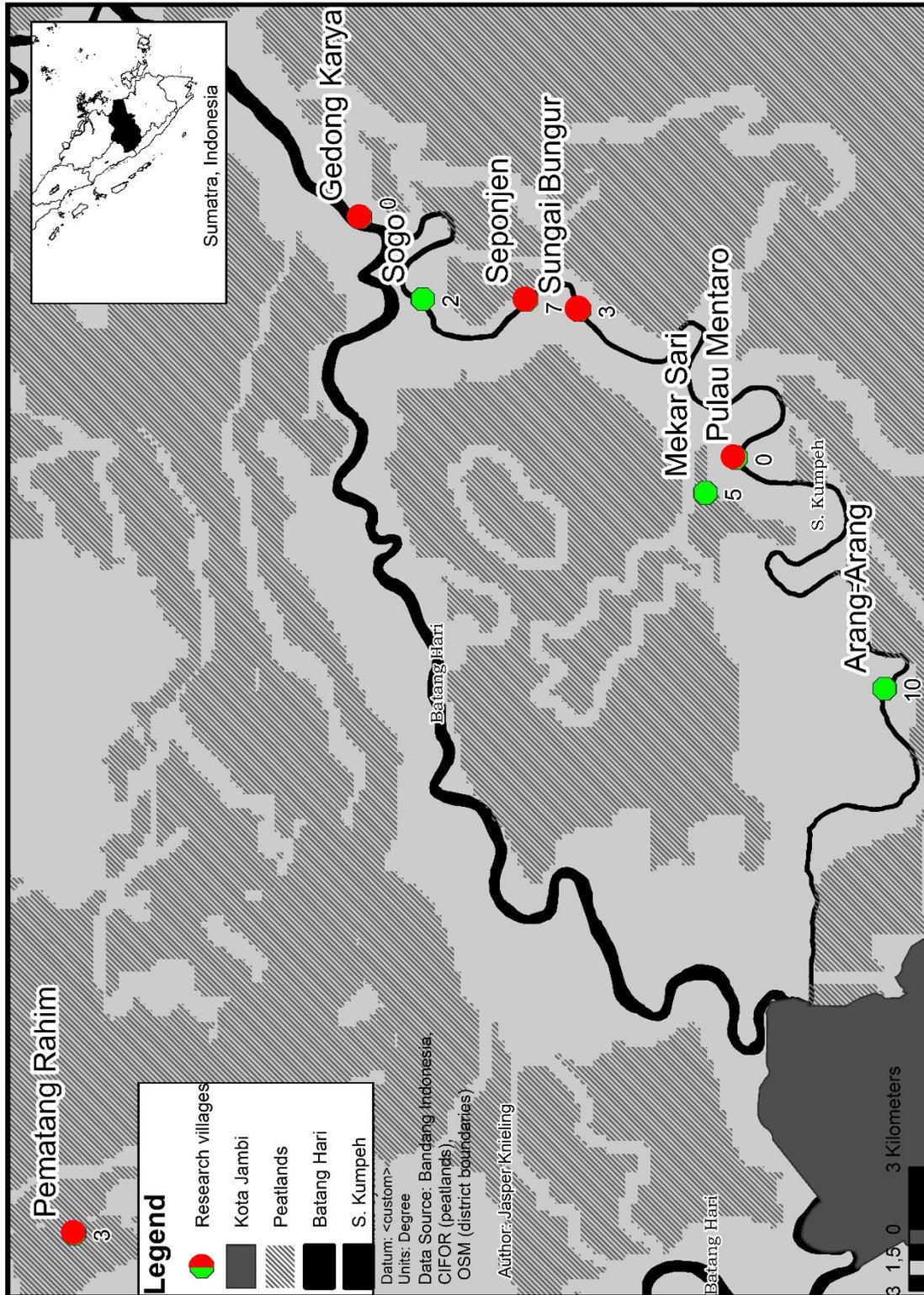


Figure 8 Map of the research area. highlighted red are Peatland Care Villages, green are villages w.o. revitalization programs. Own Illustration

### 1.4.2 Village Profiles

The visited villages were mostly linear settlements following one or two streets or a canal/river, stretching over some kilometers with now obvious delimitation to the following villages beside the density of houses swelling and declining. The administrative area always stretched far beyond the village itself. All villages had electricity most of the time and access to high-speed-internet via smartphone. Most visited houses had running water. Poultry, usually ducks are a pervasive form of livestock, generating additional income. Beside the BRG measures, none of the visited villages had extensive animal husbandry of any form. All villages had at least one mosque and a primary school. Other faiths besides the Islam are circumstantial within the rural communities. The usual means of transport are scooters and small motorcycles, which usually do not exceed 150 cc. Although still a rarity, (new) cars seem to gain importance within the villages. rapid access to more-than-basic health care was often not available, the hospital in Jambi City was mostly the closest available for most villages.

An important topic within the rural landscape of Indonesia is the concept of Transmigration, which is a form of migration that takes place in Indonesia since the times of Dutch colonial rule. Its goal is to exonerate the overpopulated islands of Jawa and Kalimantan by relocation of willing participants to lesser populated islands, e.g. Sumatra (Yulmardi, Amir, Erfit, & Junaidi, 2018).

Its zenith had the program in the 1980's, with substantial financial aid from the World Bank (Barter & Côté, 2015, p. 65). Until 2011 more than 8.8 million people have been resettled throughout Indonesia, more than 3000 villages have been created.

The procedure for the willing participants remains mostly the same. There are 2 ha given per family, 1 ha for food crops close to the families house and 1 ha for "land business", mostly for cash crops such as rubber and oil palm (Yulmardi et al., 2018, p. 283).

In Jambi alone 355,221 people came to the province through the transmigration scheme making Jambi one of the main transmigration areas (Ibid.).

### 1.4.3 Mekar Sari and Pulau Mentaro

The Village *Mekar Sari* is situated around 3 kilometers inland from *Desa Pulau Mentaro* and the *Sungai Kumpeh*. It has an area of 3042 ha of averagely 3 m above sea level. The majority of its 2551 inhabitants practice agriculture. 701 families have own land of which 687 have less



Figure 9 (F.I.t.r.) The Host's House, Stilt houses, houses. All in Mekar Sari. Photos taken by the Author 2019

than 5 ha. The houses consist of mostly wooden pile houses situated in regularly flooded plains, recently brick houses -also on stilts- have been build. Most of the roads are gravel roads, the main road leading to *Pulau Mentaro* is made of concrete. The road to *Mekar Sari* is Dirt road. The vast majority is Muslim with only 14 people being Catholics. All inhabitants are Indonesian citizen, more than half of the population is of Jawanese decent/Jawanese. *Mekar Sari* has big *Transmigrasi* Settlements that fall under the village jurisdiction. The village is surrounded by vast palm oil plantations that are often situated on drained peatlands. All houses have electricity and usually access to internet via smartphone. Water is available but of bad quality. All visited houses had at least one motorbike but cars are rare. The 2015 fires, while did not reach the village itself, affected many farmers in the region, who often have their land some kilometers away, sometimes working as plasma farmers for one of the companies in the area. next to the village, an oil palm mill is situated, its operator is RKK - *Ricky Kurniawan Kertapersada*- a palm oil company sentenced to 11.5 million € in compensations for its slash and burn practice leading in part to the 2015 fires (Regenwald.org, 2017).

*Pulau Mentaro* took part in some BRG revitalization program, namely cattle breeding, hence, no SAFA questionnaires have been conducted in this village.

### 1.4.4 Arang Arang

*Arang-Arang* is situated Approx. 30 km from Jambi next to the river and compared to the other villages the one with the highest visibly prosperity. Most houses are relatively large and stone made, the roads, according to a village official, been paved recently with concrete. Within village borders is a transmigration settlement, approx. 5 km/30 minutes with the motorbike away. Oil Palm is the dominating crop, according to the host it used to be rubber until the late 1980. during the field work, several fire incidents occurred in the *Arang-Arang* area, generating haze in the area.

Palm oil planting started in the village in the year 1992, within the village borders a *Transmigrasi* settlement can be found, dating back to 1986. Initially planned for food crop production, the inhabitants started the cultivation of oil palm without government aid. Vast parts of the peatland in the area have been drained in the 1980s. The sometimes up to 4 m deep and approx. 6 m wide canals are maintained by the government.

2014 The government started a diversification program, bringing eel breeding into the area. The program was unsuccessful and discontinued shortly after the introduction. As of today, there are no fisheries in the area. since 2009 there have been programs to establish animal husbandry. however, these programs were not carried out by the BRG and do not have the objective of sustainable management of peat bogs Both villages do not take part in village revitalization through BRG workshops but are areas of rewetting and revegetation of degraded peatlands. Deep wells have been drilled close to the village, supplying the peat with groundwater from depths of up to 30 m.

*Pulau Mentaro* holds 1456 inhabitants on Approx. 3000 ha land. MAKIN and RKK are dominant palm oil concession holders in the area. According to I#22 it has peatland of up to 3 m depth

#### 1.4.5 Seponjen and Sogo (Peatland Restoration villages)



Figure 10 Images from Seponjen (f.l.t.r.) Hosts' house, Suspension bridge, crossing the Sungai Kumpeh, loading of oil palm onto boats for transportation. Photos by the Author 2019

#### 1.4.5 Seponjen and Sogo (Peatland Restoration villages)

The Village has 1335 inhabitants Village is separated by the *Sungai Kumpeh* only allowing motorbikes and pedestrians the crossing on a suspension bridge. The area includes 64.474 ha of land, mostly used for agriculture. 90 % of its inhabitants are born in Jambi Province, 10 % come from *Jawa* or *Bugis*. Almost half of its population works as smallhold-farmers, 29. As employees.

The Village is separated by the *Sungai Kumpeh* only allowing motorbikes and pedestrians the crossing on a suspension bridge. According to expert interview I #49 the university of Jambi conducts research here on sustainable peatland management. Also, it is a *Desa Peduli Gambut*, a peatland care village.

#### 1.4.6 Pematang Rahim (Peatland Restoration Village)



Figure 11 Stilt houses above the canal in Pematang Rahim. Interview with a family in the late afternoon Photos taken by the Author 2019

The village is located in the district of East *Tanjung Jabung* north of the city of Jambi, about 2.5 hours by car. It is a linear village, following the asphalt road across a small river.

### 1.4.7 Gedong Karya (Peatland restoration Village)

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It has 4381 inhabitants, 853 of which are smallhold-farmers, making up almost one third of the working population. (Desa Pematang Rahim) and its mostly wooden houses are almost completely built on stilts, reaching heights of up to 4 meters.

In this Village, SAFA questionnaires were conducted during a one-day field stay.

### 1.4.7 Gedong Karya (Peatland restoration Village)



Figure 12 (F.l.t.r.) A typical entrance portal, a smallholder posing next to his home-made fertilizer, a BRG water level control station, a cowshed financed by BRG funds

The last village visited is situated between the *Batanghari* and the *Sungai Kumpeh*. It is a village and a transmigration settlement, comparable in size and structure to *Arang-Arang*. It stretches over 5326 ha. Unfortunately, it was not possible to obtain further information on the village.

# 2

## Methods

### 2.1 Methodological Overview

This case study was conducted in Jambi Province, Sumatra over a time span of 6 weeks. It was preceded by an extensive literature review. During the stay 7 villages, 6 of them alongside the River “*Sungai Kumpeh*” were visited. Qualitative interviews were conducted in all villages, in 6 villages quantitative research was conducted by means of a standardized sustainability assessment provided by the Food and Agriculture Organization (FAO) of the United Nations. Evaluation was done using software, namely MAXQDA, Microsoft Excel and GraphPad. In total, 51 interviews have been conducted ranging from several minutes to 2 hours. 11 of these interviews have been audio-recorded.

### 2.2 Mixed Method Approach and Triangulation

Owing to the nature of this study as an exploratory with a focus on field-testing the SAFA questionnaires as well as a multi method approach towards for potential further studies, The *a priori* conceptual framework is less of a theoretical and more of a practical one, arguing with (Greene, Caracelli, & Graham, 1989), who claim the Mixed-Methods-Approach (MMA) to be a conceptual framework of its own.

Scholars have often argued, that the borders between quantitative and qualitative social studies are nothing but fictional borders, that need to be diminished by means of MMA, with the main goals of reciprocal confirmation and improved comprehension of the information collected (Dunning, Williams, Abonyi, & Crooks, 2008, p. 147).

### 2.2.1 Triangulation

Triangulation will be defined here, as “the designed use of multiple methods, with offsetting or counteracting biases, in investigations of the same phenomenon in order to strengthen the validity of inquiry results” (Greene et al., 1989, p. 256). To gain better understanding of the phenomenon, complementary methods have been used. According to (Greene, 1987) the purpose of complementary mixed-methods approaches is to elaborate, enhance, illustrate and clarify results from one method with the results from another method. (Greene et al., 1989, p. 259) The underlying rationale hereby is, that the interpretability and validity of results rises, when the researcher capitalizes on each methods strength, eliminating the shortcomings of the single methods (Ibid). The Methods used in this case study are qualitative, semi structured interviews, quantitative, participatory observation and literature review.

### 2.1.2 Qualitative Content Analysis

The need for a qualitative research approach arises of the necessity, to grasp complex actor-environmental interdependencies, dynamics and cross-scale interactions. In addition, qualitative methods “allow a research case that is a sentient human being to speak ‘in his or her own voice’, focusing on what is meaningful or important to himself or herself rather than conforming the researcher’s conceptualization of a situation” (Montello & Sutton, 2006, p. 40).

The overall goal of the **qualitative content analysis** is the systematic approach towards any form of material gained from any form of communication. Originating in the communication sciences, it was first described the 1920s, this approach is now applied in almost any social science (Flick, Kardorff, & Steinke, 2017, p. 469). Not just the content of the material is within the focus of the method but the latent connotation of what was said can be embedded as well. The basic Idea behind this method is to maintain the system of content analysis for qualitative analysis steps without making premature quantifications (Ibid.).

The strengths of this method, if it follows established process models, can be found in its transmissibility and flexibility. The second is made possible by the possibility of feedback loops within the analysis process (Ibid. 474).

Its origins within the German scientific community lie, among others, in the works of Jürgen Ritsert who worked on the implicitly existing messages within German world War II related pulp fiction (Ibid.) Basic concepts of this methodological approach are

- (a) Integration into a communication model
- (b) A rule- based approach

(c) Categories at the center of the evaluation

(d) Quality criteria

In **(a)** the aim of the analysis is to determine the variables of the text producer (his experiences, attitudes, feelings), the situation in which the material was created, the socio-cultural background and the impact of the text.

In **(b)** the material is broken down into analysis units and processed step by step, following a content analytical sequence model.

In **(c)** the analytical aspects are grouped into categories, which are precisely justified and revised in the course of the evaluation. Mayring calls this a feedback loop in which changes of the categories remain possible throughout the data analysis.

In **(d)** the procedure aims to be comprehensible in principle, to make its results comparable with other studies utilizing a triangulation approach and to incorporate reliability tests. (Mayring, 2000)

At the core of the qualitative content analysis are 2 concepts, the inductive codebook development and the deductive category application (Ibid.). It is one of the most crucial part of the content analysis and some scholars went as far as calling it “an art” (Krippendorf 1980, S. 76 In: Mayring 2000. O.S.). (Kuckartz, 2018) counts 3 different forms of the content analysis: “content structuring”, “evaluative” and “Typecasting”. Without further elaborating the others, this methodological approach can be described as a structuring content analysis for it has been proven a versatile method within the social sciences.(Kuckartz, 2018, p. 97). Categories for the evaluation of the interview are built here to reduce the content to its relevant details and enable researcher to gain an good overview to the topic. The coding process used was a deductive-inductive category forming where a coding happened through a multi-tiered process, beginning with a rough categorization of the contents along the research questions and were further differentiated during repeatedly reading of the interview notes and summaries. Finally, a total of 32 categories was formed to elaborate the main research questions and evaluated using MAXQDA Software.

In recent years there have been numerous publications and guidelines towards this part of the process to deal with the complexity and the problem of generating categories for further research. (Kuckartz, 2018) has been a valuable source of guidance throughout the inductive codebook developement process as well as the evaluation with QDA Software.

## 2.3 Case Studies

This work can be defined as a case study, which “distinctive need (...) arises out of the desire to understand complex social phenomena” (Ying 2003a p.2 in (Kohlbacher, 2006, p. 4). There are many definitions on what a case study is ought to be. This work, follows Jeanne Hartley’s definition that a case study is a “detailed investigation, often with data collected over a period of time, of phenomena, within their context (...) to provide an analysis of the context and processes which illuminate the theoretical issues being studied” (Hartley 2004 p. 323 in: (Kohlbacher, 2006, p. 5) To once again refer to Henley:

“case study research is a heterogenous activity covering a range of research methods and techniques, a range of coverage (from single case study through carefully matched pairs up to multiple cases) varied levels of analysis (individuals, groups, organizations, organizational fields or social policies), and differing lengths and levels of involvement in organizational functioning” (Harley 2004 p. 332 in (Kohlbacher, 2006, p. 6) .This approach allows to maintain a holistic approach while investigating a contemporary phenomenon within their real-life context (Kohlbacher 2006 4), especially since the boundaries between phenomenon and context are not clearly distinguishable (ibd. 5).

### 2.4.1 Sustainability Criteria with the SAFA FRAMEWORK

Developed by the Food and Agriculture Organization of the United Nations (FAO) the Sustainability Assessment of Food and Agriculture systems (SAFA) is designed to provide an “holistic global reference framework” (FAO, 2013, p. 3) to conduct sustainability assessments as well as global comparability. It offers the assessment of crops, livestock, fishery and forestry targeting the entire value chain on a generic geographical scope. Its overall goal can be outlined as the evaluation of sustainability performance of one or more entities (FAO, 2013) The system works with 4 dimensions of sustainability namely Environment, Economy, Social and Governance and enables ex-ante assessments and ex-post monitoring (FAO 2013). It was developed to cater the needs of enterprises as well as smallholder thanks to the addition of the “SAFA Smallholder App”, a

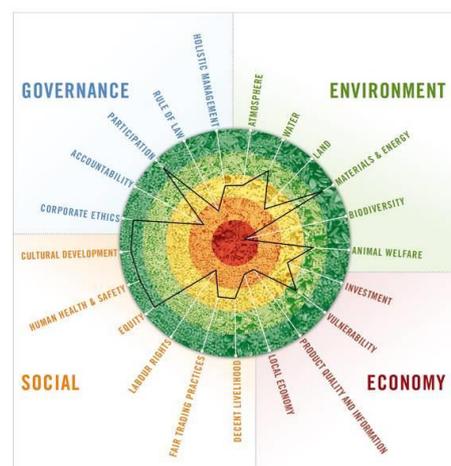


Figure 13 possible output Polygon of the SAFA assessment tool, illustrating the performance of the assessed entity Source: SAFA Guidelines. Source: FAO 2015

## 2.4.2 Voluntary Sustainability Standards (VSS) Assessment Tool Kit

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simplified Version of the tool, intended to be used directly in the field for the (self-) assessment of smallhold-farmers.

The output of the SAFA Tool is a polygon, illustrating the strengths and weaknesses of the entity along the 4 dimensions.

The framework consists of 21 themes (university sustainability goals), 58 sub-themes (objectives specific to supply chains) and 116 Indicators-read specific questions to the assessed topics (FAO 2015 3).

The Smallholder App was released in 2015 as an addition to the tool upon the request by practitioners, as some of the questions were either too complex (e.g. information towards emissions) or not fitting in the small-scale producer context. The mobile application-based tool was developed with self-assessment as well as field work in smallholder areas in mind.

The questionnaire is condensed to 100 multiple and single choice closed questions (except for basic information to be provided in the beginning) focusing on the 4 dimensions: environmental integrity, good governance, economic resilience and social well-being (FAO 2015).

The output should encourage the self-assessor to improve knowledge about their own enterprise. The App weights each answer with the help of an easy to use color system ranging from “good” (green) to average (yellow) to “no-go” (red). Some questions are “neutral” trigger questions which are designed to evaluate if a block of questions is applicable for the smallholder. In this Case study farmers did not have any animal husbandry.

## 2.4.2 Voluntary Sustainability Standards (VSS) Assessment Tool Kit

In addition to the SAFA tool part of this field work was to conduct pre-tests on an alternative assessment tool, namely the Voluntary Sustainability Standards (VSS) Assessment Tool Kit (UNCTAD, 2019) which is currently being developed and probably released in 2020 by the United Nations Conference on Trade and Development (UNCTAD). Although the complete toolkit offers a mixed method data evaluation, the main focus of this pre-test was to determine whether the questionnaire structure, which differs significantly from the SAFA smallholder App, would be a fitting approach to the evaluation of smallholder perception towards sustainability related topics. The tool was developed to analyze the drivers behind smallholders' decisions to join certification programs with the overall goal of being able to compare motivations, identify tensions and create measures to mitigate conflicts (UNCTAD, 2019, p. 3).

## 2.4.2 Voluntary Sustainability Standards (VSS) Assessment Tool Kit

Its design should allow to measure beliefs and opinions as well as general perceptions towards sustainability certification schemes. It was designed with the assessment of actors along the whole value chain in a country-level context in mind. Its goal is to identify challenges and opportunities within the VSS topic (ibid.). The whole tool will consist of open-

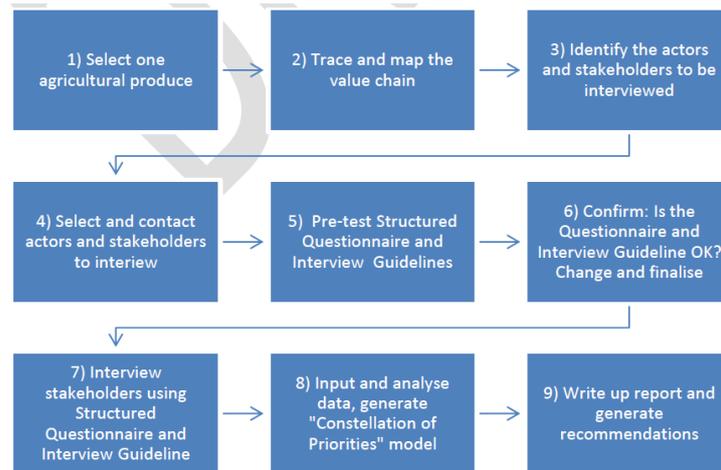


Figure 14 Suggested workflow of the SAFA Toolkit. Source: UNCTAD 2019 P. 5

ended interview guidelines for certified shareholder as well as non-certified shareholder and a structured questionnaire with close-ended questions and the Likert-scale questions which were tested in this thesis. While the system promises a comprehensive toolkit, accompanying the user the whole research process, it encourages to modify and adapt the toolkit to their own country level contexts (Ibid. 5) **Fig. 14** illustrates the suggested workflow. Worth noting is the fact that each step within the workflow is well documented and instructions for necessary actions are provided. Since this thesis bases on close- & open-end questions, as well as owing to time restraints, only the Likert questionnaire has been explicitly tested. The Advantages and challenges of the other methodical approaches shall be evaluated separately in the discussion section.

The Likert- questionnaires structure was adopted towards the question on perception towards peatland protection and fire management and can be found in **Fig. 15**.

The pre-tests were conducted in the villages of *Gedong Karya* and *Tangkit Lama*. Its advantages and disadvantages will be compared with those of the SAFA survey in the discussion section. **Fig. 15** shows the adapted questionnaire with a total of 24 questions and statements regarding sustainable peatland management and personal opinions towards peatland restoration.

The scale is adapted from the Likert type Scale ranging from “-10” to “-1” where -1 is slightly disagree and “10” to “1” where +1 is strongly agree ( UNCTAD, 2019, p. 23)



### 2.5 Participatory observation

A standard method of qualitative research in the field is the participant observation. Due to the fact that the author and his research assistant lived within the homes of small-hold farmers during the field stays this approach is almost unavoidable. Spradley (Spradley, 1980, p. 34) identifies 3 phases of participant observation: a) Descriptive observation b) focused observation and c) selective observation. These steps are designed to focus the research question, narrow down problems and select evidence for the found processes.

The first day in each village was typically used to get an impression of the area with its boundaries, main crops and infrastructure, informal talks to different people and administrative visits to the *Kantor Desa*.

In addition to the SAFA and VSS questionnaire findings of the participant observation have been well documented with photographs and entries into a field journal and have been used to complement the results.

### 2.6 Problem-Centered, Semi-Structured Interviews

The problem-centered interview was developed by Witzel (1985) as a multi-methodological instrument that includes interview, case analysis, biographical method, group discussion and content analysis. As a single method this form of interview differs in its prior knowledge and approach. The researcher prepares for the interview by studying the literature and exploring the field. The narrative principle also applies here, meaning the interviewee is supposed to be main narrator of the interview but the narrative is followed by the exploratory phase in which the researcher questions specific areas, reflects back and confronts them with contradictions that have arisen (Kruse & Schmieder, 2014, 155ff).



*Figure 16 Typical informal meeting with people in the village. Here the research assistant exchanges pleasantries with a village resident in Sogo, Jambi Province. Photo taken by the author., 2019*

Semi-structured interviews are common in the social science, allowing the interviewer to stray from the intended topic of the interview -at least to some extent- allowing new inputs to be brought up during the interview. (Mayring, 2002, p. 67) recommends open, non-biased questions.

The semi-structured interview is determined by the anticipation of a “relatively open design of the survey situation” hence, “the views of the respondent are more likely to be expressed than in standardized interviews or questionnaires” (Flick, 2002, p. 117) Relatively open means that

## 2.6 Problem-Centered, Semi-Structured Interviews

guided interviews are based on a structuring element: the interview guide. The guide summarizes everything relevant to the interview as well as partly pre-formulated questions. These blocks and questions can be designed flexibly and adapted to the interview situation. The Interview guidelines of this case study are attached in the Appendix. Some of the conducted interviews can be defined as expert interviews, since interviewees demonstrated profound knowledge and came from a background of either academics or experience in the field (see (Kruse & Schmieder, 2014, 168ff) However, most interviews were conducted with rural smallhold-farmers. The interview duration ranged between 15 minutes (conducted after the SAFA questionnaires and recorded via note-taking) and 2 hours. In longer lasting Interviews, audio recording was used, which was later translated and summarized by the research assistant. The setting of the interviews was fluctuant, ranging from formal surroundings at the University or offices to picnic blankets in a fruit tree grove. Usually, interviews were conducted in the formal part of the living room of the host. The majority of the interviews was conducted with the (male) head of the household, in some cases, women were interviewed. In the majority of interviews, at least parts of the remaining household were present during the interviews.

50 out of 51 interviews were conducted in *Bahasa Indonesia* in order to not interrupt the flow of the conversation. Interviews were not simultaneously translated by the research assistant but short summaries of the conversation were given whenever possible to give the researcher the possibility of adequate follow-up questions. 1 Interview was conducted in English with a non-native English speaker.

The selection of interviewees was done through the technique of “snowball-sampling”. Usually, after arriving in the village, a list of possible participants was provided by the *Kepala Desa* or the host. That list was extended with the interviews who recommended colleagues, family members et cetera, who fulfilled the requested requirement for the SAFA questionnaires: the smallholder had to own peatland of at least 0.5 m thickness, which was cultivated at the time of the assessment. Gender did not play a role in the selection process. However, due to conditions beyond the control of the author, most of the participants are male.



Figure 17 Interview in the Garden of the host in Gedong Karya. Picture taken by the author 2019

### 2.7 Data Generation

Over the time-span of 6 weeks, empirical data was gathered in Jambi Province, Sumatra within the sub-districts of east *Tanjung Jabung* and *Muara Jambi*.

The collection was conducted via audio recordings of interviews, keeping a field journal supported by visual information with photos. Information on the villages were the Interviews were conducted have been obtained in the *Kantor Desa*, were village profiles and general Information was displayed. In some cases, village officials provided the author with more detailed information. Historical and other information on the villages was gathered through the interviews. To be legally able to give consent to the publication all participants were above the age of 18 years.

### 2.8 Data Evaluation

While the SAFA Smallholder App originally was designed to be a holistic, android-device based “one-stop-shop-solution” with surveying and evaluation on the same device, the characteristic polygons can be obtained using third-party software such as Microsoft Excel and GraphPad. The App output in the Form of histograms was discarded in favor of these more extensive visualizations originally appearing in the tool only. The gathered data was fed into spreadsheets and mean values for every theme were calculated after assigning numeral values of 1 (bad, no-go) – 3 (Good) to each possible answer. High values equal good, low values improvable performance. Null-values were given when an indicator was applicable. The majority of questions have the same weight of “1”. However, a few questions have been given a higher rating of “2”, due to a higher sustainability impact. This is the case for question No. 9, 10, 49, 53 and 59. This weighted logic only applies to the question-level of the questionnaire, Indicators and themes have all been given the same value of “1”.

The complete results of every single SAFA questionnaire can be found in the Appendix.

The evaluation of the qualitative strain of this work was conducted with a Qualitative Data Analysis (QDA) software called MAXQDA version 2020. The process followed (Kuckartz, 2018) following (Mayring, 2000) as described in the Method section.

## Results

For the evaluation of performance, SAFA has proven to be a capable tool. To further knowledge about smallhold-farmers it is necessary to get insight into the perceptions towards sustainability, especially considering the many possible limiting factors when it comes to sustainable peat management (e.g. financial costs, knowledge about sustainable alternatives to recent practices, knowledge of the best crop choice and the global impact of one's choices). While it is the SAFA assessment was done with a focus on performance comparison between villages and especially *Desa Peduli Gambut* and non-restoration villages, the qualitative interviews are evaluated complementary to each village.

Smallholders perception towards sustainable and fire-avoiding peatland management is influenced by various factors making a mixed-methods-approach a good approach towards this topic. The SAFA questionnaires indicate a primarily economic perception towards sustainable land management. The qualitative results, seen as a whole, indicate a congruent image. Some interviewees however, displayed strong environmental concerns and interest in sustainable practices and peatland protection measures.

In total, 51 Persons were questioned, ranging from semi-structured interviews of short length with smallholders following the SAFA assessment to long talks with experts in academics field work. All of the interviewed farmers owned peatland of at least 0.5-meter thickness.

When asked what the 3 most pressing problems on peatland were, no homogenous answer emerged. Striking, however, was the fact that merely 5 of the questioned farmers mentioned fire as a perceived problem and of these 5, 2 chose the answer after the topic came up during the conversation. More within the area of interest seemed to be daily struggles and economic hurdles such as the acidity of the soil and tipping over of oil palm trees due to poor holding capacity of the peat soil (3 answers), bad yields, insufficient fertility or low productivity (each 1 answer). The biggest group however, did not notice any problems at all (7 answers). I #35, a paralegal who took part in BRG workshops, was the only one who mentioned problems that

went beyond the private context. He mentioned climate change and large-scale environmental damage.

When asked about perceived changes 1 answer stands out being recognized by 11 of 20 asked persons. Soil subsidence, that happens in peat due to the decomposition of organic matter that starts after the drainage, was often witnessed but not necessarily seen as a problem. Subsidence ranged from a few centimeters to one meter, some smallholders reported speeds of 10 cm/year. When asked about possible causes of this, no clear answer could be given and none of the interviewed knew about soil subsidence through exposure to oxygen.

The question “what do you think grows best on peat soil” was answered with “pineapple” and “Oil Palm” (each 7 answers). The rest chose some form of food crop or could not answer the question. Considering the fact that only one of the interviewed farmers was a pineapple farmer (who chose pineapple as best crop), the amount of oil palm farmers who gave the same answer shows a certain tendency towards this crop-option.



*Figure 18 tipped over oil Palm due to weak retention force of the peat soil. Photo Taken by the Author 2019*

## 3.1 Arang - Arang

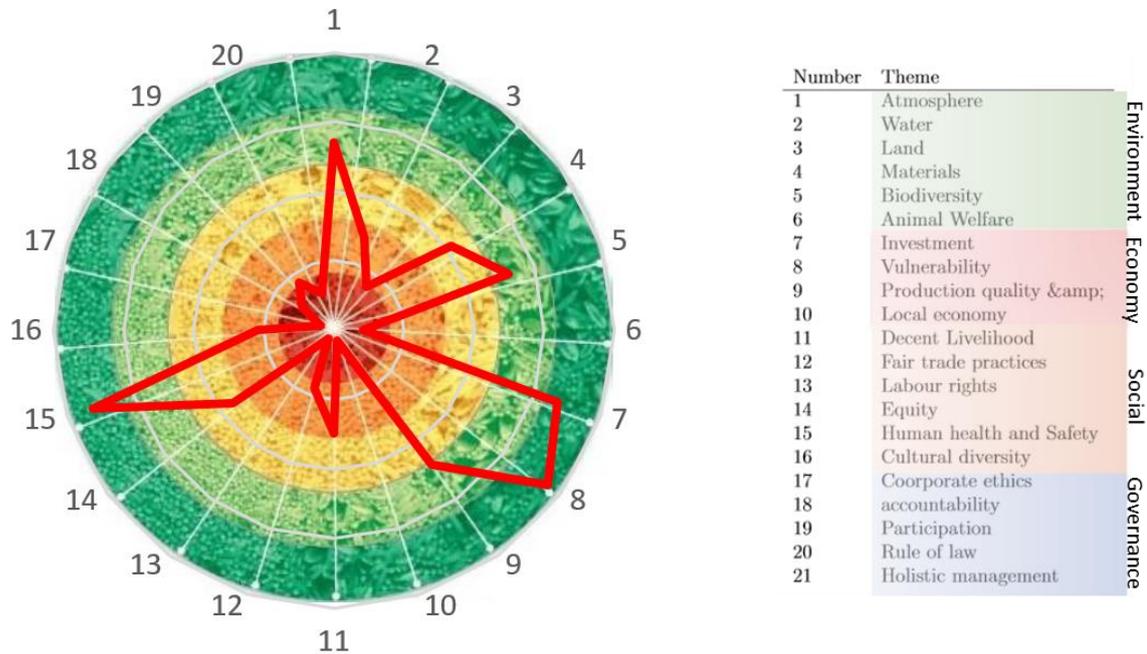


Figure 20 SAFA Results for Arang-Arang

*Arang-Arang* was the first village visited. 12 interviews had been conducted, 10 of them in combination with a SAFA questionnaire and 2 without. The interviewees were all male and of age. All of them had a combination of peat and mineral land with a combined extent of far less than 10 ha per farmer, often not exceeding 1 – 2 ha, classifying them as smallhold-farmers. All peat in this region is under slash-and-burn cultivation and most is cultivated with oil palm. 1 person in the village took part in one workshop provided by the BRG in Jambi city approx. 1 year prior to the interview. He went in the function of a village official. The workshop was conducted to provide information on sustainable and fire safe peat management. Of all Interviewees in *Arang-Arang*, he was the only one who had heard of the BRG.

Slash-and-burn practices exist on a small scale and happen under supervision of the *Manggala Aggni* fire brigade of the ministry of environment. Since the fire 2015 teams of 2 visit villages and try by means of education to minimize the fires in the area. According to one interviewed firefighter the propagated zero-burning possibility is impossible due to financial hurdles.

The general perception of peatland as a cultivation area for commodities is characterized by dissatisfaction with the yields and lack of simple solutions for cultivation. Interviewee (I) #3 stated he would rather have 1 ha of mineral soil than 5 ha of peatland. The drained soil is arable but remains of poor quality even after extensive draining. The prize for the soil is approx. 10 million ind. Rupiah/ha compared to 80 million/ha on mineral soil according to the farmer. .

Congruent with the SAFA Results depicted in **Fig. 20** main concerns expressed by farmers were of economic nature. Out of the 12 interviewed persons, only 2 (I#13 & 15) voiced concerns about peatland fires despite the fact that 5 of the farmers had made negative experiences with the peatland fires of 2015 on their own land. As main problems with cultivation on peatland, the acidity of the soil, the frequent toppling of oil palms and the low productivity were listed. I#8 mentioned high fertilizer costs.

When asked about the best crop on peatland, no trend was visible. Most interviewees had no opinion on that topic, I#10 promoted pineapple and coconut, I#8 said oil palm and pineapple, but most were unsure or in favor of the oil palm. None of the smallhold-farmers had knowledge about peatland-specific agriculture. One farmer (I#11) had heard of *Jelutung* rubber being a peatland-resistant commodity, which is a plant promoted by peatland specialists as an environmental sustainable plant (see Giesen 2018).

I#12, a supervisor on the company plantation with own land was the only one showing some knowledge about peatlands and its water household.

In summary, interviewees in Arang-Arang had never heard about peatland restoration and did not perceive fires as the most pressing topic. Peatland is perceived as a less productive form of arable soil and decision of crop is taken from a financial in **Fig. 20** indicate good resilience against financial vulnerability and high safety standards. Average results were achieved in the areas of "Atmosphere" and "Biodiversity". Poor results were achieved in the areas of "Decent livelihood", "Land" and "Accountability."

### 3.2 Mekar Sari and Pulau Mentaro

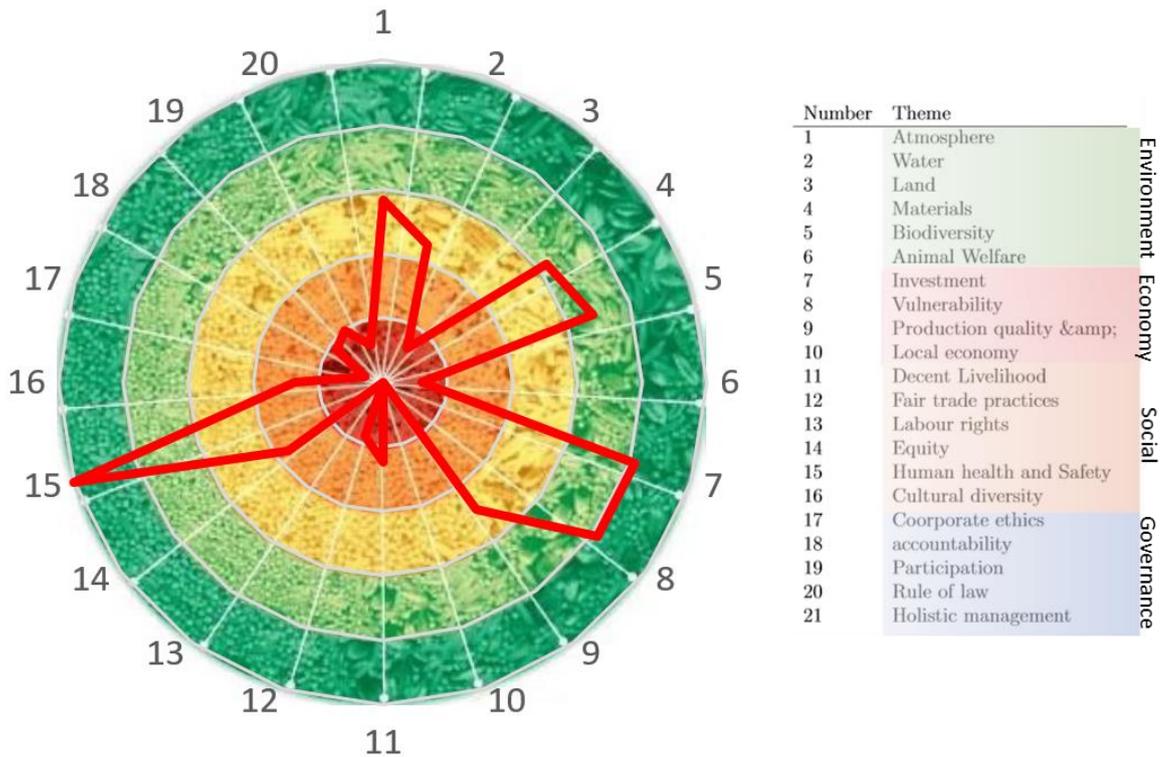


Figure 21 SAFA results of the village of Mekar Sari

In total, 10 Interviews had been conducted in *Mekar Sari* and *Pulau Mentaro*. 5 of those interviews were in combination with a SAFA questionnaire. All questioned farmers had a mixture of peat and mineral land. Oil Palm is the dominant crop. None of the questioned farmers was directly affected by the 2015 fires. There were no SAFA questionnaires in Pulau Mentaro.

While not an *Mekar Sari* being not an official DPG, some members of the village administration took part in BRG-led workshops regarding peatland restoration with an emphasis on fire prevention through canal blocking and deep well drilling. No revitalization measures were taken in both villages.

When interviewed, one of these officials (I#16) stated a lack of knowledge transfer within the village as problematic, but emphasized a problematic society mindset indicating little willingness on the part of the village population for sustainable peatland management.

Within the villages, changes on peatland were recognized. I#21 experienced a loss in fertility, I#20, 23 and 24 witnessed a loss in topsoil of significant proportions within the last decade.

I#16, a village official in *Mekar Sari* showed some knowledge and concern on peatland cultivation expressing worries regarding excessive drainage of peatlands. Access to education was already available before the BRG came into existence through so-called village extension agents, who are supposed to pass on information within the village and from *Manggala Aggni*, who have been carrying out reconnaissance and control in the areas under investigation since the 2015 fires. He advocates a comprehensive renaturation of the dry areas. However, he sees problems in the change from oil palm to food crops. Beside practical reasons, he sees the smallholder perception as a key aspect to the current problematic situation stating a purely economic view on the topic in disregard of environmental issues.

I#22 is a member of the *Pulau Mentaro* voluntary fire brigade with connection to BRG R1 and R2 working on a deep well project some kilometers outside the village. In his opinion, drainage is a “necessary evil” to acquire a stable income. He is aware of the risen fire susceptibility of peat when drained. He does see issues with big companies, namely MAKIN group for Oil Palm and *Pesona Belantara Persada*, a timber company, draining swamp areas on a big scale.

During the interview, a village official came over stating that there has been a change felt by the village society. Dry seasons are becoming hotter and the prediction of seasonal changes grows in uncertainty making harvest season unpredictable.



Figure 22 Cowshed in *Gedong Karya*, build with BRG funds. Photo taken by the Author 2019

I#24 is a teacher in *Pulau Mentaro* cultivating rubber as a second source of income and facilitator for the BRG R3 program within the village. R3 in *Pulau Mentaro* is conducted through the introduction of cattle breeding. The cow breeding was supervised by the forestry and regional development agency and started in late 2018. 12 cows were given to a group in the village consisting of 15 people. I #24 explained that the aim of the cows breeding program is to encourage people to refrain from land burning practices and to use unburned grass as fodder.

BRG conducted some trainings related to cows breeding including how to select good calf to be bred and how to build a cowshed. Similar experiences made a group of smallholders in *Gedong Karya*. in **Fig. 22** shows a similar cowshed in *Gedong Karya* build by BRG standards. Also, the issue of good governance of the group and proposal making were discussed in the training. As of now, there have been some attempts to breed but no financial gain has been made within the first year of the program’s existence.

I #24 witnessed degradation of forests in the area as well as a reduced water retention capability of the soil. He further witnessed soil subsidence of approx. 20 cm locating the cause of this subsidence in flooding and fires. There were some trainings conducted by BRG about peatland management and forestation training. There was also timber tree seedling given by the BRG to be planted around the farmer plantation as the field fence to protect the field from fire. He attended some trainings but he did not have the printed materials. He has no knowledge about broader concepts like GHG emissions. He stated that the BRG did not inflict any perception change about peatlands and environmental protection, instead, since he always thought that way, he decided to join BRG.

One village official in the *Pulau Mentaro Kantor Desa* (*transl.*: the village office) reported contrary information, stating no BRG measurements had been implemented yet. However, *Pulau Mentaro* was one of the listed villages regarding revitalization of local livelihoods (see Jambi Daily, 2019).

In *Mekar Sari* people did witness changes and displayed a high sensitivity regarding changing seasons and global trends without being aware of their existence beyond their area. Degrading soil has been witnessed by most participants but connection to practice have not been made indicating a gap between practice and knowledge. Striking is the emergence of a phenomenon labeled “change agents”, single persons within the village context displaying greater knowledge and environmental awareness than the rest. In *Pulau Mentaro* Interviewees #22 and #24 might be one of those “change agents”.

The SAFA results depicted in in **Fig. 2** display similar results to Arang-Arang, locating good performance in themes Nr. 8 and 15, average performance in themes Nr. 1 and 5 and poor results in themes Nr. 11, 18 and 3.

3.3 Seponjen (DPG)

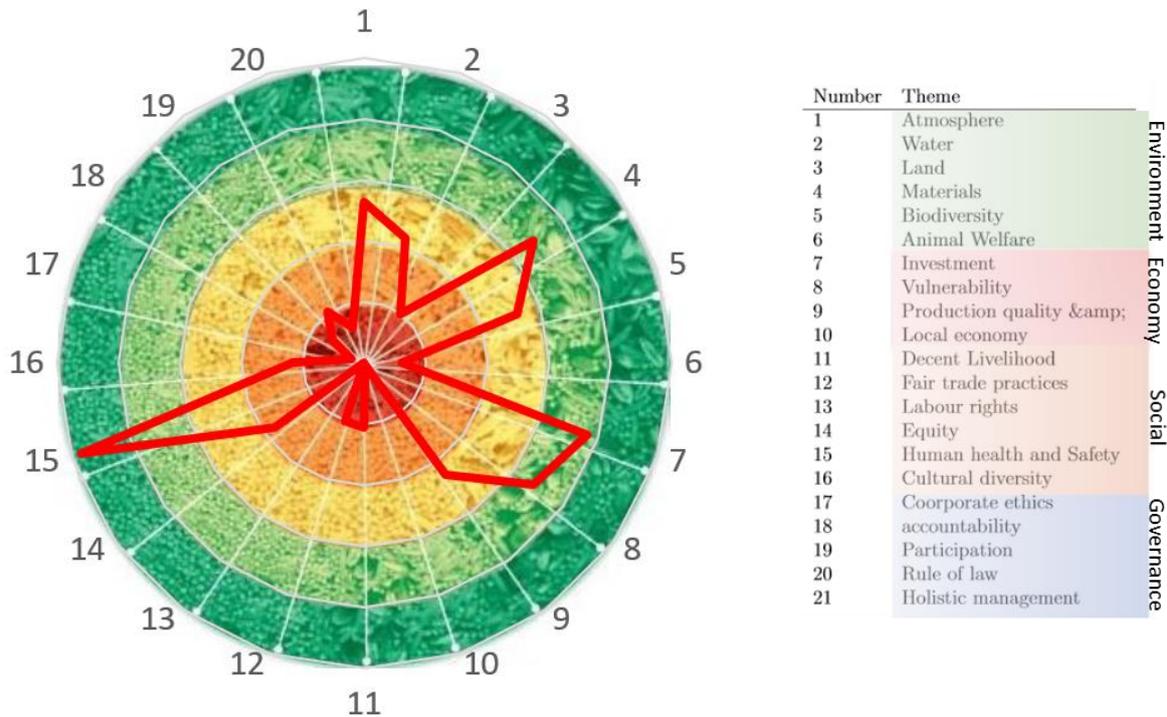


Figure 23 SAFA Results for Seponjen

In total, 15 Interviews had been conducted in *Seponjen* and *Sogo*. 9 of those interviews were in combination with a SAFA questionnaire, 7 in *Seponjen*. All questioned farmers had a mixture of peat and mineral land. Oil Palm is the dominant crop. Farm sizes did not exceed 10 ha, generally ranged below 2 ha. *Seponjen* has been an official *Desa Peduli Gambut* (Peatland Care Village) since 2018. Measures conducted by the BRG can be found in the village, belonging to all three “R” – Rewetting, Replanting and Revitalization of local livelihoods.

I #25, our host in the village, facilitator for BRG and assistant to university projects regarding pineapple cultivation as a sustainable palm oil alternative on peat witnessed soil subsistence on his land reaching a speed of 10 cm/year.

According to him, the village is eager to broaden its knowledge towards sustainable peatland management.

One of the challenges he sees for the future is to change people’s perception towards sustainable land use, as of now people prefer the conventional way of land management using chemical fertilizer and practices. Attendance in the workshops is often combined with the demand for compensation, an indication for a lack of intrinsic motivation towards this topic. I #25 mentioned a lack of funding as well as a missing long-term strategy when it comes to sustainable peatland management. Even though animal husbandry is promoted by the BRG

to work in close connection with the cultivation of Oil Palm in form of generating fertilizer while simultaneously enforcing a zero-burning strategy due to the fact that cattle needs the potentially burned grass, little effect is noticeable.

I #31 is a facilitator for the BRG in the village of *Sungai Aur* for the last 2 years. For the economic revitalization a workshop was conducted regarding non-timber-forest products such as *eceng gondok* (water hyacinth), *Pandan*, and *Rumbai*. I #31 is intrigued by the economic potential of those commodities. He states the participants wanted to take part in more workshops signaling much interest for economic alternatives and diversification. In his experience, people lack awareness of environmental issues. He gives the example of the 2015 fires happening in a protected area (TAHURA) close by. People showed little concern for the burning area since it had no (economic) value to them. Canal blockings were perceived differently, while some were very much in favor of the re-wetting of drained peatlands, others would prefer to continue the known practice.

I #32, a village official who went to a BRG Workshop towards economic revitalization reported little interest within the community, a lack of follow up visits/workshops and knew of nobody who applies the learned knowledge. When asked about his perception towards peatland protection he said he had little interest in that before the workshop and no perception change had occurred.

The SAFA results, depicted in in **Fig. 23** display the same pattern as the other villages locating good performance in themes Nr. 8 and 15, average performance in themes Nr. 1 and 5 and poor results in themes Nr. 11, 18 and 3.

In **summary**, similar patterns to *Mekar Sari* and *Pulau Mentaro* can be observed. While most interviewed smallholders did not know much about the peatland problematic and perceived *Gambut* as a normal soil, although difficult to cultivate, some individuals displayed great concern and knowledge upon the topic. Spillover effects from “change agents” to other village inhabitants were not noticeable considering the neighbor (I #37) and brother of I #25 displayed little to no interest in the peatland topic beyond economic concerns while #25 was an activist who regularly took part in BRG workshops and measures such as canal-block building and pineapple test-fields conducted by the university of Jambi.

3.4 Sogo (DPG)

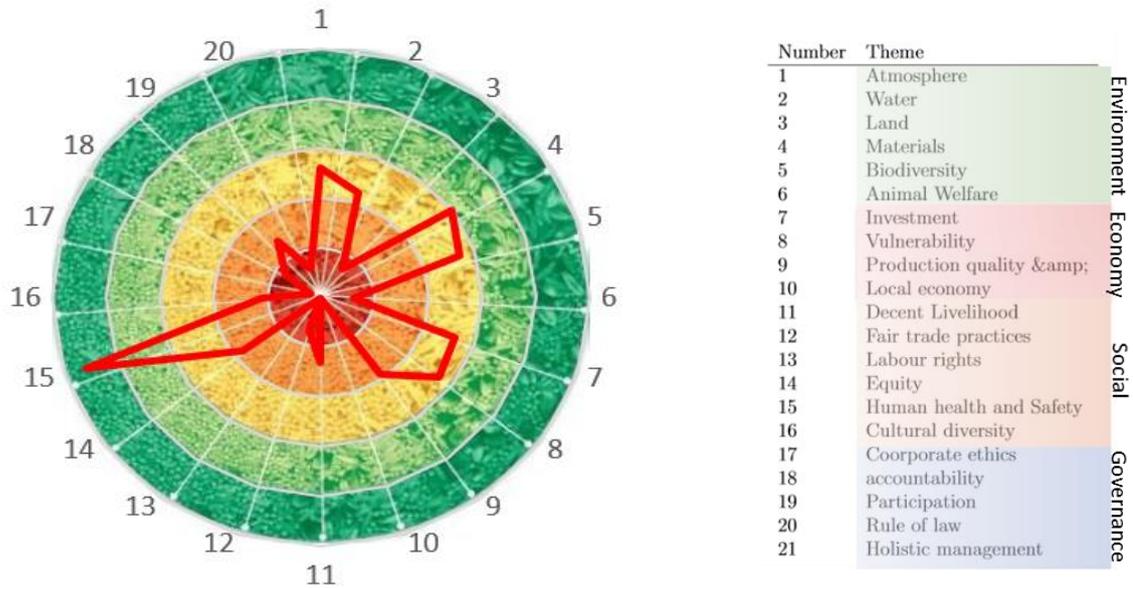


Figure 24 SAFA results in Sogo

2 SAFA questionnaires and 5 qualitative interviews have been conducted in in Sogo.

In Sogo, the BRG conducted a R3 cattle breeding project giving 7 Buffalos to a group of willing smallhold-farmers while simultaneously conducting workshops in 2018. I #34 is the leader of the breeder group. Sogo is a peatland care village. 1 SAFA Interview has been conducted.

I #34He reports that 5 of the 7 Buffalos did not survive the first year due to heat, drought and sicknesses. After the two-day training, no follow up was done and the farmers felt left alone with problems they had no solution to. They were unable to pay for a veterinary. Before the BRG propagated cattle farming as a sustainable addition to peatland cultivation promoting a system of zero-burning policies combined with increased income, an aquaculture government, which does not exist anymore. I #35, a man who became a voluntary paralegal (in this context: a person helping with legal disputes on a village level) through BRG funding showed vast interest



Figure 25 A woman in Sogo presenting the traditional Pandan baskets she made in a BRG workshop

and knowledge on the peat-problematic on a global scale. In his opinion, smallhold-farmers are not the ones to blame, but the big companies buying and draining peatlands on a larger scale. He perceived environmental degradation over the 20 years he lives in the area and is determent to improve the situation.

I #37, a female tailor who took part in a *Pandan* weaving workshop to promote traditional peatland management practices reported that even though she enjoyed the workshop and learned about traditional basket weaving, she did not learn about the importance of peatland ecosystems. Also, she never sold any of her products due to the lack of access to markets which are willing to pay enough money for her products. I #37, a woman who went to the same workshop, made a similar experience, stating they could sell her products for 10.000 rupiah, approx. 1 € for a day's work of weaving.

In the bordering village of *Sungai Bungur*, a roadside village within 10 minutes driving distance, an interview (I #40) was conducted with a BRG paralegal and environmental activist for the NGO *Walhi*. He is the chairman of the consultative body (*Ketua Badan Permusyawaratan Desa*) in the village as well as a primary school teacher and concerned about the state of the peatlands since he witnessed soil subsidence, water pollution and loss of fertility on the peat soil over the last years. He actively works with an NGO to promote Paludiculture in the form of sustainable timber production.

The workshops he visited did not inflict a perception change. He trusts into traditional local practices, including slash-and-burn emphasizing on the role of big companies in the recent fire events. When asked about the perception of the people in the village, he stated that the society does not concern itself with bigger issues and broader contexts. BRG focuses on the practical things including how to take care of the peatland area according to its function and what to do if the area is damaged. There is little knowledge beyond practical information. The underlying processes are not pointed out to them and they don't know what is happening if the peat would be drained and what would happen as a consequence. Their knowledge remains in the field of commodity production. The term *Gambut* was unheard off, according to I #40, indicating little knowledge about the extent and importance of peatland beyond village boundaries.

According to the BRG, in 2017 there were ambitions to establish alternative means of income for the population of the village by means of tent-renting-services and other non-agricultural business ideas (BRG, 2017). This however was never fully implemented and questioned persons did not know of it.

**In summary**, workshops in Sogo seemed to have had little effect towards a perception change towards sustainable peatland management. Information given by the BRG was either too little

### 3.5 Pematang Rahim (DPG)

as it was in the case of Buffalo breeding or economically not feasible as it was the case with the *Pandan* weaving. In both cases, participants recorded no perception change indicating again a mere economically approach from both sides.

### 3.5 Pematang Rahim (DPG)

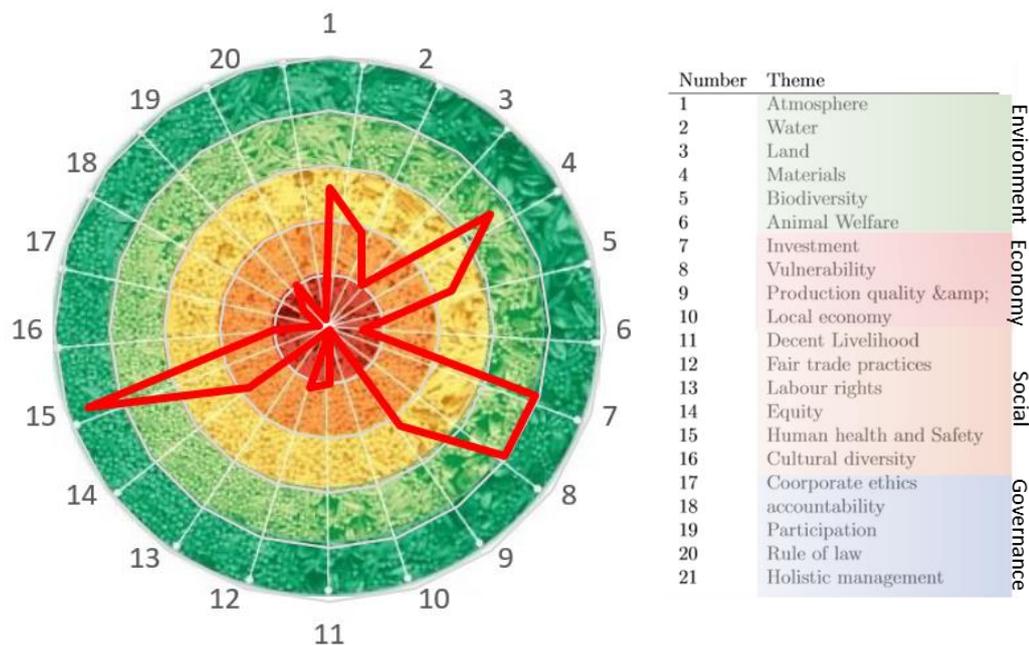


Figure 26 SAFA results for pematang Rahim

2 SAFA Interviews have been conducted in the Village of Pematang Rahim. The peatland Care village performed similar to the other villages. SAFA questionnaires were conducted with smallhold farmers, 1 of which, I # 44 experienced fire on his land, losing almost 50 % of his palms in 2015. When asked about his perception towards the importance of sustainable and fire-free peatland management he stated to not be interested in either, since the fire brigade would handle such problems. nNone of the inerviewd farmers had heard of the BRG nor any peatland restoration measures or alternative means of generating income. I #44 and #45 were actively against rewetting, stating that nothing would grow anymore.

## 3.5 Gedong Karya (DPG)

In *Gedong Karya* no SAFA interviews had been conducted. Within the village boundaries is a *Transmigrasi* settlement, where the VSS Assessment pretest and qualitative interviews have been conducted. The transmigration area is embedded in peatlands and was severely affected by the 2015 fires according to the interviewed smallholders. *Gedong Karya* is a restoration village since 2016 making it the oldest DPG in the case study. Six VSS questionnaires have been filled out as a pretest for potential further studies and will be discussed in the discussion section.



*Figure 27 A transmigrant farmer stands next to his hand made fertilizer. Photo taken by the Author 2019*

I #50, a female smallholder who went to a BRG workshop on sustainable peat management and fertilizer production from manure states she did not just change practices but also learned about the environmental importance of peatlands as well as the danger of fires. She spreads her knowledge as a teacher in “field schools” where she shows other smallholders how to apply zero-burning and the use of cost-effective and environmentally friendly fertilizer.

Another farmer (as seen in **Fig. 27**), I #51 took part in a BRG workshop about fertilizer production but did not change his perception about the importance of peatlands and its worth to preservation. He did, however, improve his financial situation by cutting fertilizer costs by 70% and an increased production of 60%. The only issue he had with peatlands was the high acidity, which he treated with government-funded dolomite.

While not keen to talk about the topic in an interview-setting, the knowledge and interest of the host and his social circle, that came visiting during the overnight stay, was profound. During the breakfast for example, a 1-hour conversation about the potential of eco-tourism on restored peatlands unfolded and indicated a further interest in the topic not present in the other villages.

To **sum up** the findings in *Gedong Karya*, results differ from the other visited villages, since the “change agents” seem to have a more substantial reach towards the village community than in the other investigated villages. People displayed pride in their partaking in fire protection and sustainable land management and warned about fire risks through even the smallest spark. During informal conversations, the topic often shifted towards environmental issues.

### 3.6 Results from the expert Interview #49

When interviewed in his office at the University of Jambi (UNJA), I #49 promoted intercropping with minimal tillage as a sustainable way of cultivation peat soils. Although there have been field tests for example in *Seponjen*, a large-scale change of crop is not feasible within the research area, due to high costs for the smallholders.

He witnessed a perception change after the fires of 2015, and reports that smallholders would like to change crop. He deplors the somewhat passive role of the BRG, who does not help smallhold-farmers by providing seedlings. He knows of 30 farmers willing to change their crop to pineapple on peatlands which would help keep the water level at 40 cm, slowing peat degradation. He attended workshops as a keynote speaker and is of the impression these workshops contribute to a perception change.

He sees economic hurdles as most pressing on a lack of practice and perception change, since he calls for a more substantial program by the government with longer running time, more follow-up on workshops and education measures. Zero-burning- for example, is not feasible for smallhold-farmers, who cannot afford machinery to use alternative methods and do not have the education on alternative techniques.

### 3.7 Conclusions from all Interviews

The conducted interviews all followed the central question, how local initiatives towards sustainable peatland management could impact the perception of stakeholders.

The results from all visited villages indicate, that the BRG workshops towards the revitalization of local livelihoods were successful to some extent. While only I#50 said she changed her attitude towards peatland, in other cases practices changed due to financial incentives. In some cases, people living close to participants of workshops did not hear about the BRG as it was in *Seponjen*, where I #30 lived right across a BRG canal block and had never heard of such measures and with the brother of a local activist I #25 how claimed to never have heard about the BRG.

“Fire” was only named in 5 interviews as a perceived problem, while economic issues dominated most answers. This indicates small interest in the dangers of unsustainable peatland-management.

In all villages, Slash-and-burn practices were not condemned but deemed a probate practice when done with care.

### 3.7 Conclusions from all Interviews

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One village stood out from the others, *Gedong Karya*, were during all interviews and informal conversations a more interested tone was noticeable and farmers took pride in showing their sustainable practices.

All DPG- villages had persons with more in-depth understanding of the topic and an interest for environmental problems. They did not experience a perception change due to the fact that they were already on a high awareness-level of environmental and societal problems. The partaking in BRG workshops only deepened their understanding and knowledge of peatlands.

The findings suggest, that if any perception change is happening within the villages, it is very likely to happen within the halo of such “change agents”.

**In conclusion**, the 51 interviews conducted in villages in the Jambi Province indicate little awareness on sustainable peatland management and a mere financial perspective on the land.

Perspective was assessed by asking for the most pressing topics on peatland, the reason for witnessed change and the knowledge towards peatland restoration as an indicator of interest. To further assesses that knowledge, participants were asked to elaborate their choice of crop/ explain what grows best on peatland. While some farmers had good knowledge of crops better suited to the wet and acidic soils in peat swamps, virtually all chose palm oil since it delivered best financial results.

Within the transition towards sustainable land use, single actors stood out with their interest and knowledge. In the next section, an attempt is made to include the role of local change agents in a possible conceptual framework to be used in potential further studies regarding this topic.

Striking was the difference of the self-evaluation of the smallhold-farmers, who generally freely admitted to primarily care about financial well-being and the expert interview, which would make an interesting topic for further studies.

However, applying the gathered information on the research question, the results suggest that there are #change agents' who can contribute to a change in perception as a central unit within a village. As of now, in all villages except *Gedong Karya* did not perform sustainable in terms of environment, Governance and social life.

## 3.8 Comparison of SAFA Results

## Comparison of all results

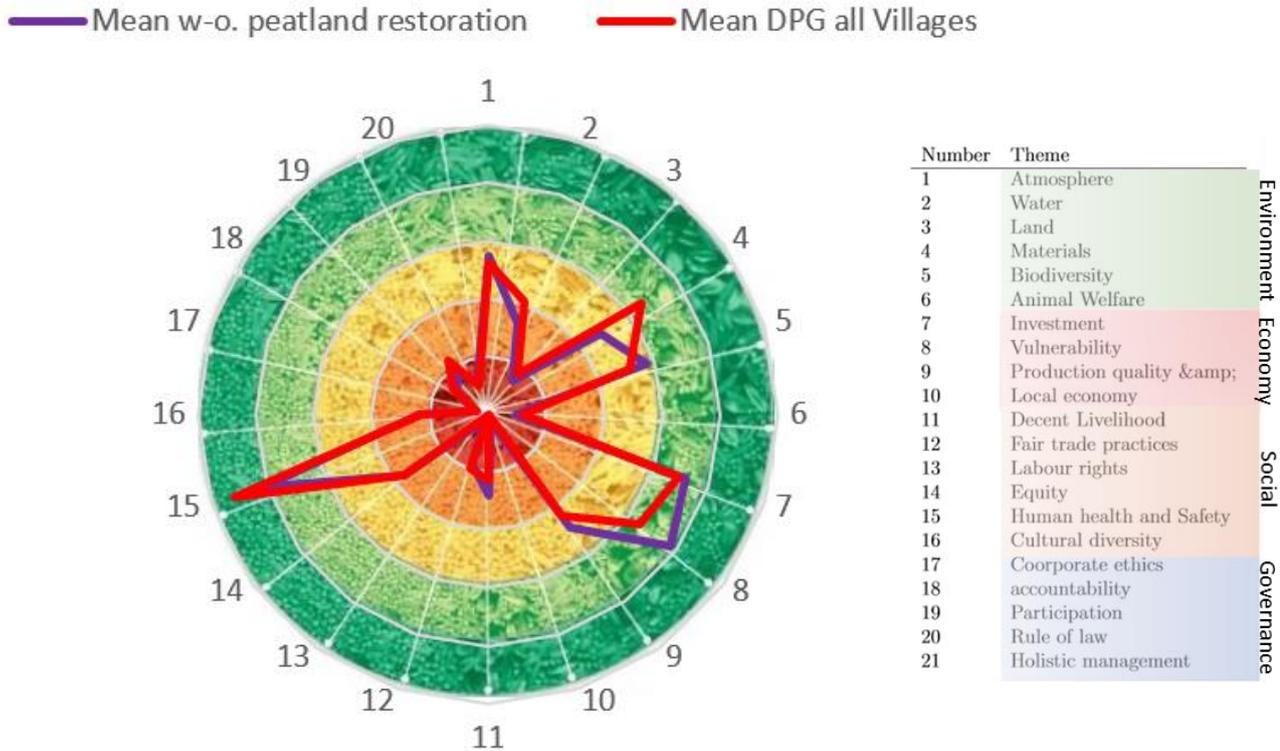


Figure 28 Comparison of the means of villages without restoration measures and Peatland care villages

Following the individual SAFA assessment from each village the question was addressed if DPG villages differ from villages without peatland restoration. Regarding their performance on 4 sustainability dimensions. And 21 themes. The clustered results of the SAFA assessment between “DPG” villages and “without peatland restoration” villages are depicted in **Fig. 28** The analysis shows overlapping results in the areas “Fair trade practices” (Nr.12), “accountability” (Nr.18), “human health and safety” (Nr.15), “decent livelihood” (Nr.11) and “atmosphere” (Nr.1). Slight differences can be seen in the theme of materials (Nr.4), Biodiversity (Nr.5), Investment (Nr.7) and vulnerability (Nr.8) In no theme were significant differences noticeable.

As depicted in **Fig 27**, the clustered results of the SAFA questionnaires do not differ significantly. A test of significance (student’s t-Test) delivered values of 0,95, indicating a not-significant deviation between both clustered results compared to the single-village results, the T-Test delivered similar results, ranging between 0.66 and 0,95 which can be seen in **Table 2** in the appendix.

### 3.8 Comparison of SAFA Results

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The strongest results and overall- deviation from the mean achieved *Mekar Sari*, which follows the same pattern as the other villages, but finishes slightly above average in the fields “15”, “8” “1” and “4”, which explains the T-test value of 0.66.

Slightly better performance regarding “Investment” and “Vulnerability” could be observed but both, DPG-villages and non-DPG-villages perform well in this theme. Also, in the “Materials and Energy” theme, better results (“good”) were achieved than from non-DPG-villages with an “average” performance. Again, within the themes of the SAFA questionnaire, no significant deviation could be observed and visible differences are too small to be relevant.

However, a test of statistical differences using Student’s t-Test did not show a significant difference between the two tested groups yielding p-values of  $p= 0.94$

The entirety of conducted SAFA results indicate, that no practice change happened due to the work of the BRG. This study did not find any form of “spillover effects” from workshops on sustainable peat management and revitalization of local livelihoods through alternative modes of income (e.g. *Pandan* weaving or buffalo breeding). However, SAFA was not designed to specifically assess highly specific soil and tillage and can only provide an overview of sustainable practices along the four dimensions. Its shortcomings and possibilities will be further elaborated in the discussion section of this work

The overall SAFA results did not differ significantly between the villages, indicating that partaking in the peatland care village program of the BRG does not have any spillover effects towards sustainable land management. Visualization of the results makes it clear that while the small farmers have a solid financial sustainability, ecological considerations have a low priority within the practices of the farmers. However, findings from *Gedong Karya*, *Seponjen*, *Sogo* and *Sungai Bungur* show how the BRG programs may aid to assist interested persons in learning more about sustainable management.

## Discussion

### 4.1 Discussion of the SAFA Results

#### Peatland Care Villages (Desa Peduli Gambut)

#### Villages with no BRG Involvement

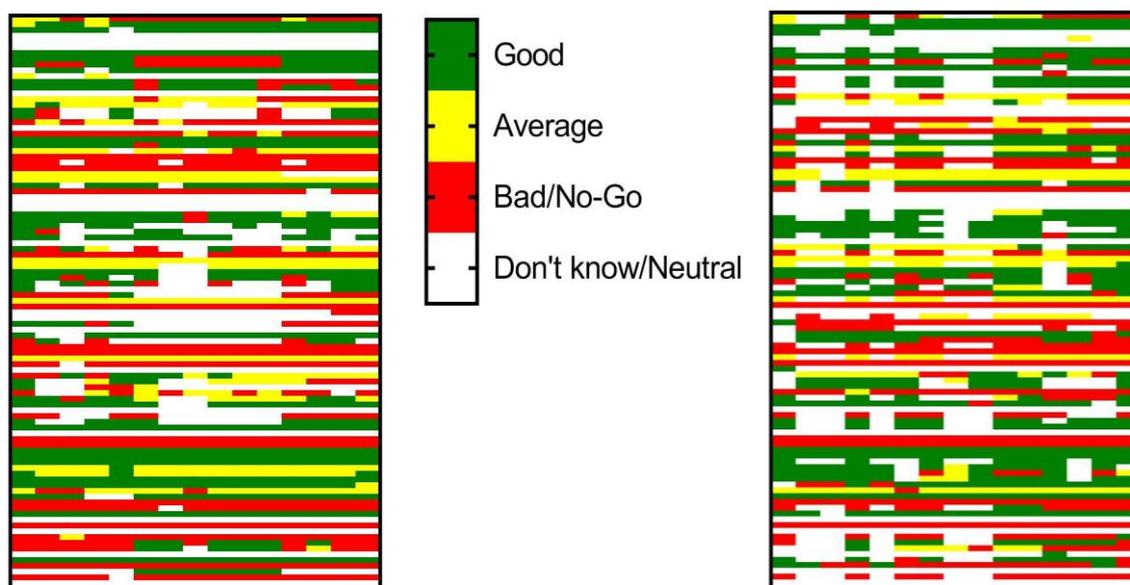


Figure 29 Heatmap comparing the SAFA results on DPG with non-restoration villages. Own Illustration on the basis of the SAFA questionnaires

**Fig. 29** shows a visual summary of all responses from the SAFA questionnaire in the form of a heatmap. Green stands for an answer with a value of 3, yellow for an answer with the value of 2 and red for an answer with the value of 1. Neutral answers were rated 0.

While the presentation as a spider-diagram provides useful views for the evaluation of sustainability performance, the shortcomings will be illustrated here. The white bands that consistently run through all 30 answers are striking.

All in all, there were 15 neutral answers possibilities of which 3 were so-called "trigger questions", whose purpose is to activate or deactivate question segments. For example, if the trigger question about livestock is answered in the negative, no further question about livestock

will be asked. The remaining neutral answers are results of unwillingness or un-ability to give an answer. Question 83 for example, “*In case of harassment or discrimination amongst your employees (e.g. sexual harassment of women), how would you respond*” was left out because both parties, the research assistant and the interviewee felt extremely uncomfortable talking about such a ‘taboo’ topic. The same logic applies to questions of the category “wage level” because participants might lie in order to not bring ‘shame’ among them by admitting financial hardships.

While being a well-designed tool for the assessment of smallholders worldwide by having comparable methodological approaches and comparative results, during this field study some shortcomings became apparent.

The SAFA Smallholder App is designed with self-assessment in mind and is ought to be used as a voluntary training tool for smallholder-farmers wishing to assess their performance along the 4 dimensions of sustainability. Additionally, scholars and government agencies alike should be able to use the tool to a high degree of satisfaction.

The tool offers the potential to not just improve performance but knowledge when it comes to global sustainability issues.

In line with findings by other scholars (amongst others Gayatri, Gasso-tortajada, & Vaarst, 2016, Gasso, Oudshoorn, Olde, & Sørensen, 2015) this study sees a lack of assessment of social issues, for example landscape perception and nature cultural services, which would be beneficial for a MMA concerning perception towards environmental issues. However, the SAFA questionnaire performed well in the economic sector, delivering precise acquisition of data on capacity of investments and economic resilience.

Although “environmental context-specific issues” were found to be effectively covered by the SAFA Tool (Ibid. 150), this study’s findings suggest a more specialized tool working towards perceptions of smallholder.

In summary, the SAFA smallholder App proved to be an effective way of benchmarking sustainability performance of peatland smallholders in the *Sungai Kumpeh* area, but its generic design due to its self-claimed global applicability led to a large body of themes not necessarily relevant for the assessment of smallholder perception. While the SAFA assessment delivers reliable and comparable results of smallholder’s performance on sustainability issues along the 4 dimensions environment, governance, economics and social aspects, underlying motivation and drivers of certain patterns of behavior cannot be assessed nor extrapolated from the data collected.

### 4.2 Discussion of the VSS Toolkit Pretest

The pretests conducted in the Villages of *Gedong Karya* and *Tangit Lama* did show, that the methods of a Likert-bases scale have the potential do deliver substantial information on the smallholder perspective on sustainability and certification schemes. All participants understood the design well and were able to place their opinion within the scale. In general, questions (1 – 12) were better understood than statements (13 – 24).

As with the SAFA questionnaire, close supervision (1:1) was necessary, as questions were often not understood. In general, there was a high level of insecurity on the part of the participants during all the examinations and no distinction could be found between SAFA and VSS regarding this issue. The duration of the 24 question assessments ranged between 15 and 30 minutes.

**In summary**, more testing needs to be done with the VSS Toolkit. However, this short field test showed results encouraging to examine the tool more closely and to consider it for further research in the field of mixed method approaches regarding smallholder certification. Although not tested, does the comprehensive structure of the yet-to-be-released toolkit make an appealing impression and might contribute to globally comparable results.

### 4.3 Limitations of this Study

Doing case studies in the field in Jambi brought along some challenges and unique characteristics that will be addressed here briefly, beginning with the role of the research assistant within the field work and the bias of translations.

Temple & Young, 2004 write about the role of the translator: “[...]the boundaries between the roles of translator and other roles in the project become blurred. The translator always makes her mark on the research, whether this is acknowledged or not, and in effect some kind of ‘hybrid’ role emerges in that, at the very least, the translator makes assumptions about meaning equivalence that make her an analyst and cultural broker as much as a translator.” (Ibid. 171).

This was especially important within this field work since the translator was also assisting in everyday situations, organizational tasks and was tasked with the summary of the qualitative interviews conducted. The researcher was hence forced to give up control over certain aspects of the evaluation. Additionally, during interviews, control over the course of conversation was limited due to the delayed and shortened translation. Coming from an epistemological position that accepts bias as given in any research, the researcher acknowledges and accepts the

### 4.3 Limitations of this Study

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possible bias of the translations as well as the possible bias of the snowball-sampling as circumstantial. Additionally, the personal bias of the researcher should be addressed here. Critical self-reflection as well as reflection of the interview partners and situations are necessary steps to acknowledge and - if possible - avoid ethically questionable procedures in the research situation. (see Fink, 2016, p. 15 ).

Reproducibility and intersubjective verifiability in the sense of a Popperian understanding of science is simply not possible in this qualitative case study. Within the framework of this participatory character of the study, pre-planning as well as exact methodical pre-conception was only conditionally possible. Therefore, triangulation is of great importance in order to substantiate knowledge obtained by means of cross-referencing.

Other hurdles this work endured were the dependency on publications in English language provided by the BRG, limiting *a priori* research. Gaining insight into the DPG selection process proved to be contradictory, in one case a village was visited which was labeled as DPG but the *Kepala Desa* had never heard of such a program nor was any peatland in the area, since it all burned down in the El Niño fires of 1994.

Also, due to strict permit politics by the Indonesian government, free, spontaneous mobility was not possible, since for every visited village a letter of recommendation was necessary.

Contrary to prior warnings, an assistant-researcher team of mixed genders proved to be little problematic apart from sometimes tedious search for an 'appropriate' accommodation.

### 4.4 The Need for a Framework for further Research

While this work had an explorative character and was on a specific topic, namely the perception towards peatland restoration measures and possible practice changes due to environmental education, it became apparent that this case study is embedded in a more general/abstract context. Following the field work, an extensive literature study was conducted to determine in which conceptual framework further studies should be embedded and which underlying trends can be observed within this study.

During the field work, 2 underlying processes were identified as abstractions of the ongoing phenomenon. The first, transformation processes and the second, the concept of agency will be discussed in this section and brought into the broader context of Multi-Level-Perspective-Theories as a framework for possible further studies as well as an *a posteriori* framing for this thesis. Furthermore, besides a political ecology meta point of view of distributive equity and dependencies, the underlying topic of sustainability issues needs to be more in focus of the framework. Although a practice theory approach seems suitable, a lack in literature that addresses the transformation of (sustainability) perceptions towards practices became apparent. To truly understand a transition towards a sustainable peatland management, the processes within the actor are just as relevant as the external drivers. A conceptual framework that addresses the complex mechanisms that are happening within a case study context and take supraregional, background structures in account is needed. Therefore, the Multi-Perspective-Approach was chosen and will be further elaborated in the next section.

Transitions are understood here as “changes from one socio-technical regime to another”(Geels & Schot, 2007, p. 399) or, to put in differently, the alteration of cultural practices, production/consumption and governance within a certain area. When talking about ‘agency’ and the role of ‘change agents’ a physical entity single human being, who’s perceptions influence its practices and can therefore change the entirety of the socio-technical regime. Socio-technical landscapes can be understood as a literal landscape “we can travel through” (Geels & Schot, 2007, p. 403) as well as “metaphorically as something that we are part of, that sustains us” (Ibid.). **Fig. 29** illustrates the trajectories of different transitions within a (meta)physical landscape.

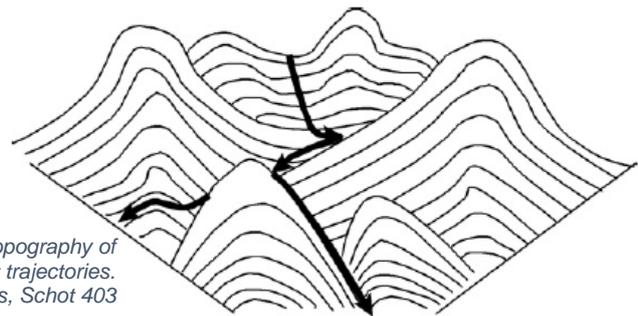
The concept of agency or, more specifically speaking the role of ‘change agents’ within a transition phase towards multi-dimension sustainability has been increasingly researched on, especially in the field of sustainability studies.

(Ernst, A., Welzer, H., Schönborn, S., Gellrich, A., Briegel, R., David, M., 2013) wrote on the existence and role of ‘change agents’ within communal measures to achieve higher

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sustainability (Ibid. 156). Within the field of sustainability research, the concept of 'change agents' has only been roughly theorized (Sommer & Schad, 2014, p. 48). 'Change agents' may be defined as individuals who influence the innovation-relevant decisions of other actors. 'Change agents' thus have a central mediating role in the diffusion process (Rogers 1995, p. 27 ff. in: Sommer & Schad, 2014, p. 50). However, assumptions on intrinsic motivations and educational background remain only implicitly within the body of literature (Sommer & Schad, 2014, p. 50).

While there is a substantial body of literature toward transitions as well as the role of actors within a socio-spatial context (see for example Schatzki, 1996 for a practice theory approach) and a relatively newly emerged branch of geography dealing with sustainability transitions as a task to fight global climate change, dependencies on fossil fuels etc., the extended theory of a Multi-Level-Perspective on transition processes developed by Geels (2002) has proven to be of great service in regards to socio-spatial processes within the conducted case study.



*Figure 30 Topography of development trajectories.  
Source: Geels, Schot 403*

## **The Multi-Perspective-Approach (MLP)**

One framework which tries to understand and describe the dynamics of socio-technical transitions is the Multi-Level-Perspective (MLP). Originally developed by Geels in 2002 to answer the question of the emergence of technological transitions within in socio-technical regimes using the example of the emergence of steamboats in England in the 19th century, this framework has been used for almost 20 years to understand as well as explain processes of change (see Geels, 2002). Based among others, the socio-economic concept of co-evolution (Nelson and Winter 1982) and similar considerations of Rip/Kemp (1998) (Ibid. p.1259).

Geels introduced a heuristic research framework with multi-level perspective for long-term empirical case studies, who explicitly focuses his attention on the role of technological change in modern societies and wants to explain why some new developments are established in time,

while others cannot be implemented. His considerations were initially explicitly focused on the role of technological change in modern societies where he seeks to explain why some of the newcomers establish themselves with the times, while others are not able to assert themselves. Within the last decade he and scholars around him (see Witkamp et al 2011) broadened the focus of the framework now considering not only technological, but also to socio-economic innovation processes in general (e.g. Witkamp et al. 2011).

Geels understands transitions to be consequences of the “Interplay between multi-dimensional developments” at three levels, which each stand for one hierarchical element within the world of transitions (Geels, 2014, p. 23). At the bottom of this hierarchy is the so-called *niche* (the locus of radical innovations). Atop that, a *regime* (the locus of established practices and associated rules) is situated, followed by the concept of the *landscape* (the surrounding, hard-to-change socio-technical regime).

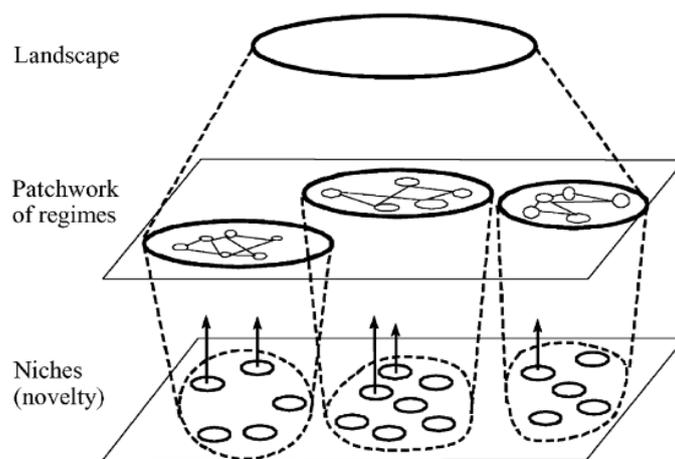


Figure 31 The MLP Framework, illustrated. Source: Geels 2002. p.1261

**Fig.31** illustrates the concept showing how *niches* may influence *regimes* which might ultimately change the *landscape*. The relations between these three concepts and their form of a nested hierarchy are understood as multi-level-perspective and shall be further elaborated here.

*Niches* can be defined as “initially unstable sociotechnical configurations with low performance. Hence, niches act as ‘incubation rooms’[...]” (Geels, 2002, p. 1261). They are the crucial element providing the possibility of change within an otherwise rigid system.

It is of importance to keep in mind that not only a *niche* is responsible for change or, to put it differently, is not the only concept that allows for change to enter the three-fold system. Geels himself quotes Kemp et al ((2001) in: Geels 2002. p. 1261), saying “It is the alignment of developments (successful processes within the niche reinforced by changes at regime level and at the level of the sociotechnical landscape) which determine if a regime shift will occur”.

From the outset the dynamics in these *niches*, in addition to general social development, are shaped by existing *regimes* in their field of application, for example by the socio-economic, technological and institutional structures, market constellations and patterns of use in a media

sector. On the one hand, these well-established regime structures can ensure stability and reliability of expectations over a long period of time, but on the other hand they can also lead to rigid path dependencies and lock-in effects (Ibid. 1259). *Regimes* contain semi-coherent regulatory systems, infrastructures and institutions that are controlled by the dominant actors and are shaped and determined internally (Geels 2002, 1260). They are therefore the predominant model of problem solving for social subsystems as the agricultural sector would be one. *Regimes* work within a set of rules. Geels (2014) distinguishes three types of regime rules: (i) Cognitive rules, which contain common convictions, mission statements, goals, routines, problem definitions and central heuristics. Legally binding contracts become (ii) regulatory rules, guidelines, standards and laws. (iii) Normative regime rules are represented by social behavioral norms, role relationships and values (ibid, 910). These sets of rules are supported by various social groups and serve the orientation and coordination of their activities. Finally, *Landscapes* are the realms of slow development of big upheavals such as cultural - and broad political changes among others (Geels 2002 p. 162). Changes within the Landscape can put pressure on regimes, enabling “windows of opportunity” for *niches*.

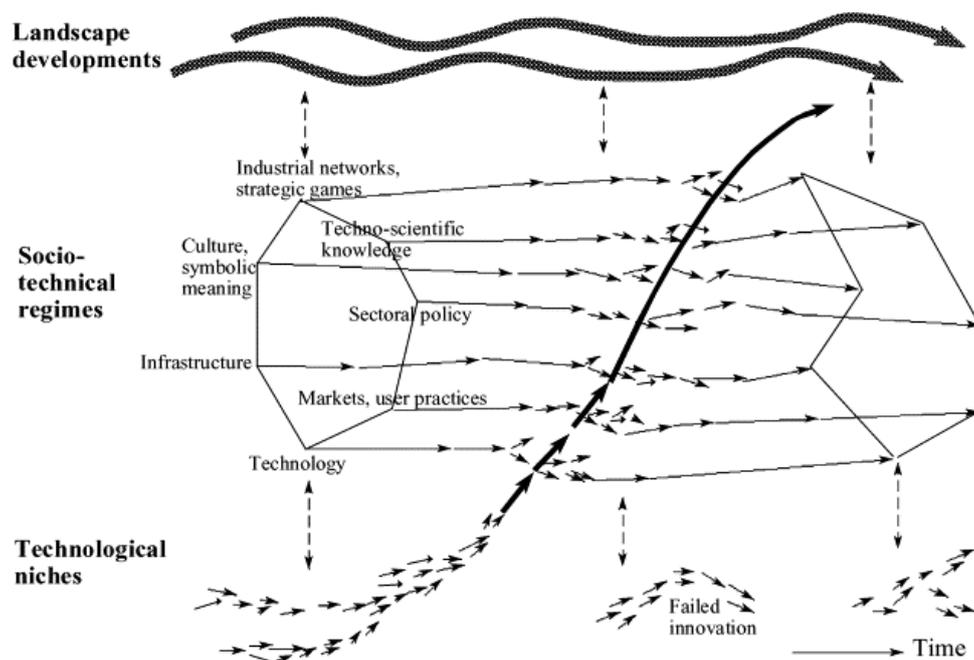


Figure 32 A schematic illustration of the process of technological transitions within the MLP framework. Source: Geels 2002. 163

As shown schematically in **Fig. 32** an example from the music industry will illustrate the interaction between *niche*, *regime* and *landscape*: over the span of nearly a century, the record industry had established a regime of traditional sales and analogue distribution mechanisms. with the internet and the principle of downloading music, the established regime experienced a shock to which it was unable to react due to its inertia and entrenched patterns of action. As

a result, the niche innovation of online music services was able to prevail against a powerful regime (see Dolata 2011). If you look at this process, it quickly becomes clear that not all aspects of the example can be explained by niche and regime. The highest level, the *landscape*, has an influence within the system. In the analogy of internet music, it would be the emergence of extensive internet use and area-wide broadband connections, which promotes the emergence of niches. *Landscapes* thus create the conditions for change through their existence as "external structure or context for interactions of actors" (Geels, 2002, p. 1260).

It becomes apparent in **Fig. 32** – and has been criticized in literature that actors are not specifically included within the framework. However, Geels and Schot (2007) underscore the importance of actors within an underlying multi-dimensional model of agency (Ibid. 403). The rules within the *niches* and *regimes* are intertwined with actors acting upon (and against) them, making actors central elements within the MLP approach.

Adapted by Geels (2004, 2014) as an answer to emergent criticism towards a lack of attention towards sub-surface structures of power and politics and to incorporate a political economy perspective, a reevaluation of the MLP was done. He enriched the *regime* concept with insights from political economy. Explicitly, this means bringing in collective actors and enable a more differentiated point of view towards power.

The basic idea is that policymakers and incumbent firms can be conceptualized as often forming an alliance at the regime level oriented towards maintaining the status quo“ through resistance strategies (Geels, 2014, p. 26). Within the MLP concept, a *regime* has 7 dimensions: policy, technology, user practices, science, cultural meaning, infrastructure and policy as it can be seen in **Fig. 32**, Geels argues that politics of power cannot be adequately theorized within the MLP framework. Therefore, he tries to accommodate the element by bringing in collective actors. There are two ways in which interdependencies arise between policymakers and companies: on the one hand, companies are dependent on the government when it comes to general governance structures, property rights or compliance with contracts. On the other hand, capitalist societies are dependent on growth and capital accumulation, which forces the state to act in the interest of capital accumulation. There are three ways of capital accumulation: (i) Dependency leading to relational networks and close connection between big business and senior policy makers. (ii) Frequent contacts between policymakers and industry could lead to internalization of ideas. (iii) Firms using “corporate political strategies to influence policymakers” (Ibid. p 27). He further argues that during a time of neo-liberal dominance, the interdependencies have risen due to de-regulation, privatization and other results of a liberalization of global markets. Geels quotes Lindbloom (2001. P. 223) who states fittingly:

“Compared to those elites, the voices, say, of consumer and environmental groups are infrequent and weak. [...] The two elites overwhelm all other contributors to what consequently fails to become an illuminating competition of ideas” (Geels, 2014, p. 27) .

**Summing up**, one potential way of incorporating power and politics and thereby underlying factors of dependencies and distributions of authority within a specific area is by conceptualizing relations between big businesses and suggestible policymakers as a “core regime level alliance, which often resists fundamental change” (Ibid.). The application for this case study as an *a posteriori* framing is appealing since the relevant factors, which emerged during the field work (transition and the role of agency) can be assessed through a critical lens, considering not just local processes but underlying capitalist structures amplifying these processes. How perceptions are a critical part within the framework and the importance of a complementary qualitative approach in form of MMA will be further elaborated in the next section with the example of transition analysis in a case study in Cameroon.

### Roles of perceptions within MLP

According to Vogel et al (2020), who analyzed stakeholders’ perceptions on sustainability transition pathways in in the cocoa sector in Cameroon, a transition can be triggered by an introduction of new technologies, a change in organizational structures between actors and the system or a change of practices (Ibid. 2). In any way, innovations towards sustainability transitions emerge through the way of the MLP approach. They stress the importance of perceptions of actors stating that the emergence of an innovation is not solely based on objective arguments but highly subjective. *Niche* actors could have highly divergent perceptions towards a specific topic than *regime* actors making perceptions an important element within the MLP approach (Ibid.). Therefore, they argue “actors and their perceptions towards the innovation are essential for triggering transitions” (Ibid. 3). However, their studies found a uncoordinated perceptions indicating varying valorizations of innovations based on the beliefs and perceptions of the people questioned (Ibid. 8). They found the emergence of sustainability transitions to be obstructed and if at all going into uncertain directions and conclude that an alignment of actors needs to be done to direct the sustainability transition. Vogel et al interpret an observed a diversity of perceptions towards potential sustainable future scenarios as *regime*-internal tensions maybe indication the opening of an “window of opportunity” (Geels 2002. P1360) for niche innovations to gain momentum and eventually change the regime (Vogel et al 2020. P. 9).

Applying the MLP and the results of Vogel et al. to the case of the peatland-farmers in Jambi illustrates the good applicability of the theoretical considerations for this case study:

A sector (agriculture) is at the verge of a necessary transition from unsustainable and dangerous peatland use towards a more sustainable solution of cultivation (read: generating income) by different potential means. The agricultural sector serves as the regime in a global landscape of increasing (simultaneously demanding more sustainable) consumption. A “window of opportunity” is hence created by the ever-growing demand and international pressure within the realm of worldwide commodity value chains. For a *niche* to successfully use such a window and change the reigning *regime* of extensive, unsustainable and merely on financial sustainability focused production, it needs not just to offer objectively fitting alternatives but additionally is forced to appeal to the perceptions of all stakeholder involved.

This thesis therefore argues that the state led approach towards sustainable peatland management and fire prevention through the BRG is just one of potential pathways towards the overall goal. Extension of already existing certification schemes and thereby the creation of financial incentives might as well work as a potential third or fourth option not yet considered. In the case of cocoa farmers in Cameroon a certification focus pathway was perceived to be more attractive by questioned smallholders although a certification pathway has been criticized to be Top-down and ignoring contextual circumstances of the countries it is applied in. Also, the consumer orientation needs to be questioned (Vogel et al 2020. P. 10). Vogel et al argue for a need of more research on “alternative market linkages to those obligating to adopt certification” (Ibid.). The MLP perspective could be applied to further the knowledge on why perceptions on peatland sustainability have changed so little over the last years and why despite the urgency and generous international financial aid so little has happened yet. The framework offers an extensive backdrop for a comprehensive illumination of the topic on all levels and a possibility to structure practical work. The extended approach according to Geels can represent a transition and provide an explanatory approach that illuminates the background of a concrete case. Especially the factor of Regime actors who are not open to change and use neo-liberal power structures to maintain the status quo. Could be of interest for further research. A working thesis for further studies might be how incumbent regime actors within the agricultural sector in Jambi have used various forms of power to resist changes towards more sustainable (peat)land-management.

### 4.5 Final Conclusions

This thesis had the aim of answering 2 main questions within realm of sustainability issues, which were developed *a priori* to the field work.

**Firstly, to what extent did the work of revitalization of local livelihoods contribute to a perception change on actor-level within peatland restoration villages?**

**Secondly, can a difference in practice regarding four dimensions of sustainability be found between restoration and non-restoration villages?**

To answer these questions a mixed methods approach comprising of literature review, qualitative interviews and quantitative surveys were conducted.

The findings show that there was no perception change apparent within DPG Village communities and no practice change whatsoever could be found when comparing restoration villages with non-restoration villages.

However, during the research process a third question became apparent and was put into words by Lund (2014): "Of what is this a case?" While this may be answered on a very concrete level this is a case of smallhold-farmers in the province of Jambi who struggle with sustainable peatland management due to a conflict of interest between preserving the environment and gaining a decent income in a scene of highly globalized commodities the abstraction of this case reveals more complex patterns of human actions and perceptions.

During the case study one critical element had been observed, in particular the possible role of single actors as promoters of change within a village community. So, on a more abstract level, this field study is a case of 'change agents' within rural communities and the potential role of these actors in sustainability transitions. Furthermore, a third abstraction was done to incorporate a 'meta-level'. The philosophical stance of political ecology was elaborated to help understanding the more in-depth processes of society as a whole emphasizing on the human impact on ecosystems as well as global dependencies and inequalities leading to unsustainable practices which need to be incorporated to understand the complex reasons behind economic hardship and the witnessed focus on economic resilience.

This thesis therefore calls for a new approach building on the conceptual framework of Transition studies and Multi-Level-Perspective in general and sustainability cultures in particular to investigate issues on an actor level within the broader field of sustainability transitions. Furthermore, this study wants to encourage to further investigate transition processes and perception changes as well as potential roles of governance and certification schemes might have. Returning to the MLP-Approach and the case study of Vogel et al, this thesis sees potential pathways leading towards a more sustainable peatland management in

#### 4.5 Final Conclusions

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Jambi province. It is of great importance for any further studies, to research actors' perceptions, and consider underlying structures of global supply chains as well as the distribution of wealth and associated dependencies, inflicting possible transitions towards a more sustainable future.

## References

- Afriyanti, D., Hein, L., Kroeze, C., Zuhdi, M. [Mohammad], & Saad, A. (2019). Scenarios for withdrawal of oil palm plantations from peatlands in Jambi Province, Sumatra, Indonesia. *Regional Environmental Change*, 557–558(9), 562. <https://doi.org/10.1007/s10113-018-1452-1>
- Afrizal, J. (2019, December 28). Jambi loses \$1.2 billion due to environmental damages. *The Jakarta Post*. Retrieved from <https://www.thejakartapost.com/news/2019/12/28/jambi-loses-12-billion-due-environmental-damages.html>
- Afrizal B, J. (2019, September 22). Police name 249 suspects in forest fires. *The Jakarta Post*. Retrieved from <https://www.thejakartapost.com/news/2019/09/22/police-name-249-suspects-in-forest-fires.html>
- Alue Dohong (2017, August). *Peatland Restoration in Indonesia: Strategy and Approaches in Restoring Degraded Peatland in Indonesia*. Tropical Forestry - Innovation and Change in the Asia Pacific Region, Cairns. Retrieved from [https://www.researchgate.net/publication/327882429\\_Peatland\\_Restoration\\_in\\_Indonesia\\_Strategy\\_and\\_Approaches\\_in\\_Restoring\\_Degraded\\_Peatland\\_in\\_Indonesia](https://www.researchgate.net/publication/327882429_Peatland_Restoration_in_Indonesia_Strategy_and_Approaches_in_Restoring_Degraded_Peatland_in_Indonesia)
- Antriyandarti, E., Sutrisno, J., Rahayu, E. S., Setyowati, N., Khomah, I., & Rusdiyana, E. Mitigation of peatland fires and haze disaster through livelihood revitalization: A case study in Pelalawan Riau. *Journal of Physics: Conference Series*, 1153(1), 12131. <https://doi.org/10.1088/1742-6596/1153/1/012131>
- Armanto, M. E., Wildayana, E., Imanudin, M. S., Junedi, H., & Zuhdi, M. [Mohd.] (2017). Selected Properties of Peat Degradation on Different Land Uses and the Sustainable Management. *Journal of Wetlands Environmental Management*, 5(2), 14–22. <https://doi.org/10.20527/jwem.v5i2.120>
- Barter, S. J., & Côté, I. (2015). Strife of the soil? Unsettling transmigrant conflicts in Indonesia. *Journal of Southeast Asian Studies*, 46(1), 60–85. <https://doi.org/10.1017/S0022463414000617>
- Beckert, B. (2017). *A post-frontier in transformation: Land relations between access, exclusion and resistance in Jambi province, Indonesia*. Retrieved from [https://ediss.uni-goettingen.de/bitstream/11858/00-1735-0000-0023-3DBD-F/1/Dissertation\\_Barbara\\_Beckert.pdf](https://ediss.uni-goettingen.de/bitstream/11858/00-1735-0000-0023-3DBD-F/1/Dissertation_Barbara_Beckert.pdf)

## References

---

- Blaikie, P. (2008). Epilogue: Towards a future for political ecology that works. *Geoforum*, 39(2), 765–772. <https://doi.org/10.1016/j.geoforum.2007.07.004>
- Blaikie, P. (2016). *The Political Economy of Soil Erosion in Developing Countries*. London: Taylor and Francis. Retrieved from <http://gbv.eblib.com/patron/FullRecord.aspx?p=4530682>
- BRG (2017). SUNGAI BUNGUR: JADIKAN DESA PEDULI GAMBUT MAJU DAN MANDIRI. Retrieved from <https://www.facebook.com/221307594893786/posts/sungai-bungur-jadikan-desa-peduli-gambut-maju-dan-mandirimasyarakat-desa-sungai-/523296004694942/>
- BRG (Jan. 2019). *THREE YEARS OF PEATLAND RESTORATION IN INDONESIA: REPORT*. Cambridge. perception. Retrieved from <https://dictionary.cambridge.org/de/worterbuch/englisch/perception>
- Climate-data.org. Klima Jambi. Retrieved from <https://de.climate-data.org/asien/indonesien/jambi/jambi-972263/>
- Desa Pematang Rahim. Profil desa Pematang Rahim. Retrieved from <https://pematangrahim.desa.id/first/artikel/99>
- Dunning, H., Williams, A., Abonyi, S., & Crooks, V. (2008). A Mixed Method Approach to Quality of Life Research: A Case Study Approach. *Social Indicators Research*, 85(1), 145–158. <https://doi.org/10.1007/s11205-007-9131-5>
- Ernst, A., Welzer, H., Schönborn, S., Gellrich, A., Briegel, R., David, M. (2013). *SPREAD - Scenarios of Perception and Reaction to Adaptation. Szenarien der Ausbreitung von veränderten Handlungs-und Einstellungsmustern.: Zentrale Projektergebnisse der BMBF-Fördermaßnahmen. Abschlusskonferenz im Rahmen des 10. FONA-Forums, 09.-10. September 2013*. Retrieved from [https://www.fona.de/medien/pdf/Projektergebnisse-Soz\\_Dimensionen\\_2013.pdf?m=1548322650&](https://www.fona.de/medien/pdf/Projektergebnisse-Soz_Dimensionen_2013.pdf?m=1548322650&)
- FAO (2013). *safa Sustainability Assessment of Food and Agriculture systems indicators*. Rome.
- Fink, M. (2016). *Soziale Sicherung im Spannungsfeld gesellschaftlicher Transformation - Eine partizipative Studie in Küstendörfern der Fidschi-Inseln*. s.l.: Universitätsverlag Göttingen. Retrieved from <http://www.oapen.org/search?identifizier=610405>
- Flick, U. (2002). *Qualitative Sozialforschung: Eine Einführung* (Orig.-Ausg., vollst. überarb. und erw. Neuausg., (6. Aufl.)). *Rororo Rowohlt's Enzyklopädie: Vol. 55654*. Reinbek bei Hamburg: Rowohlt-Taschenbuch-Verl.

## References

---

- Flick, U., Kardorff, E. v., & Steinke, I. (Eds.). (2017). *Rororo Rowohlts Enzyklopädie: Vol. 55628. Qualitative Forschung: Ein Handbuch* (12. Auflage, Originalausgabe). Reinbek bei Hamburg: rowohlts enzyklopädie im Rowohlt Taschenbuch Verlag.
- Freedman, A. (2019, September 23). Skies turn red across parts of Indonesia as crisis from fire-induced haze escalates. *The Washington Post*. Retrieved from <https://www.washingtonpost.com/weather/2019/09/23/skies-turn-red-across-parts-indonesia-crisis-fire-induced-haze-escalates/>
- Gasso, V., Oudshoorn, F. W., Olde, E. de, & Sørensen, C. A.G. (2015). Generic sustainability assessment themes and the role of context: The case of Danish maize for German biogas. *Ecological Indicators*, 49, 143–153. <https://doi.org/10.1016/j.ecolind.2014.10.008>
- Gayatri, S., Gasso-tortajada, V., & Vaarst, M. (2016). Assessing Sustainability of Smallholder Beef Cattle Farming in Indonesia: A Case Study Using the FAO SAFA Framework. *Journal of Sustainable Development*, 9(3), 236. <https://doi.org/10.5539/jsd.v9n3p236>
- Geels, F. W. (2002). Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study. *Research Policy*, 31(8-9), 1257–1274. [https://doi.org/10.1016/S0048-7333\(02\)00062-8](https://doi.org/10.1016/S0048-7333(02)00062-8)
- Geels, F. W. (2004). From sectoral systems of innovation to socio-technical systems: Insights about dynamics and change from sociology and institutional theory. *Research Policy*, 33(6), 897–920. <https://doi.org/10.1016/j.respol.2004.01.015>
- Geels, F. W. (2014). Regime Resistance against Low-Carbon Transitions: Introducing Politics and Power into the Multi-Level Perspective. *Theory, Culture & Society*, 31(5), 21–40. <https://doi.org/10.1177/0263276414531627>
- Geels, F. W., & Schot, J. (2007). Typology of sociotechnical transition pathways. *Research Policy*, 36(3), 399–417. <https://doi.org/10.1016/j.respol.2007.01.003>
- Greene, J. C., Caracelli, V. J., & Graham, W. F. (1989). Toward a Conceptual Framework for Mixed-Method Evaluation Designs. *Educational Evaluation and Policy Analysis*, 11(3), 255–274. <https://doi.org/10.3102/01623737011003255>
- Hansson, A., & Dargusch, P. (2018). An Estimate of the Financial Cost of Peatland Restoration in Indonesia. *Case Studies in the Environment*, 2(1), 1.37-8. <https://doi.org/10.1525/cse.2017.000695>
- Hartill, J., Hergoualc'h, K., Comeau, L.-P., Jo, S., & Lou, V. (2017). How does conversion from peat swamp forest to oil palm plantation affect emissions of nitrous oxide from the soil? A case study in Jambi, Indonesia. *EGUGA*, 10086.

## References

---

- Hein, J. I. (2019). *Political ecology of REDD+ in Indonesia agrarian conflicts and forest carbon. Routledge studies in political economy*. Abingdon, Oxon, New York, NY: Routledge.
- Hooijer, A. [A.], Page, S. [S.], Jauhainen, J., Lee, W. A., Lu, X. X., Idris, A. [A.], & Anshari, G. (2012). Subsidence and carbon loss in drained tropical peatlands. *Biogeosciences*, 9(3), 1053–1071. <https://doi.org/10.5194/bg-9-1053-2012>
- Jambi Daily (2019, April 29). Restorasi Gambut Berdayakan Ekonomi Masyarakat, Jadikan Garam Nipah sebagai Komoditi Unggulan di Jambi. *Jambi Daily*. Retrieved from <http://jambidaily.com/detail/restorasi-gambut-berdayakan-ekonomi-masyarakat-jadikan-garam-nipah-sebagai-komoditi-unggulan-di-jambi/>
- Joosten, H. (2015). *Peatlands, climate change mitigation and biodiversity conservation: An issue brief on the importance of peatlands for carbon and biodiversity conservation and the role of drained peatlands as greenhouse gas emission hotspots : Policy brief*. ANP: 2015:727. Copenhagen.
- Kohlbacher, F. (2006). The Use of Qualitative Content Analysis in Case Study Research. *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research*, 7(1). Retrieved from <http://www.qualitative-research.net/index.php/fqs/article/download/75/154>
- Kruse, J., & Schmieder, C. (2014). *Qualitative Interviewforschung: Ein integrativer Ansatz. Grundlagentexte Methoden*. Weinheim: Beltz Juventa.
- Kubitza, C., Krishna, V. V., Alamsyah, Z., & Qaim, M. (2018). The Economics Behind an Ecological Crisis: Livelihood Effects of Oil Palm Expansion in Sumatra, Indonesia. *Human Ecology*, 46(1), 107–116. <https://doi.org/10.1007/s10745-017-9965-7>
- Kuckartz, U. (2018). *Qualitative Inhaltsanalyse. Methoden, Praxis, Computerunterstützung* (4. Auflage). *Grundlagentexte Methoden*. Weinheim, Basel: Beltz Juventa. Retrieved from [http://ebooks.ciando.com/book/index.cfm?bok\\_id/2513416](http://ebooks.ciando.com/book/index.cfm?bok_id/2513416)
- Kunz, Y., Otten, F., Mardiana, R., Martens, K., Roedel, I., & Faust, H. (2019). Smallholder Telecoupling and Climate Governance in Jambi Province, Indonesia. *Social Sciences*, 8(4), 115. <https://doi.org/10.3390/socsci8040115>
- Lamb, K. (2019, September 24). This is daytime!: bright red haze from Indonesian rainforest fires envelops city: Surreal footage shows Jambi swamped in thick cloud of pollution. *The Guardian*. Retrieved from <https://www.theguardian.com/world/2019/sep/24/this-is-daytime-bright-red-haze-from-indonesian-rainforest-fires-envelops-village>
- Leifeld, J., & Menichetti, L. (2018). The underappreciated potential of peatlands in global climate change mitigation strategies. *Nature Communications*, 9(1), 1071. <https://doi.org/10.1038/s41467-018-03406-6>

## References

---

- Mayring, P. (2000). Qualitative Inhaltsanalyse. *Forum Qualitative Sozialforschung*, 1(2). Retrieved from <http://qualitative-research.net/fqs/fqs-d/2-00inhalt-d.html>
- Mayring, P. (2002). *Einführung in die qualitative Sozialforschung: Eine Anleitung zu qualitativem Denken* (5., überarbeitete und neu ausgestattete Auflage). Beltz-Studium. Weinheim, Basel: Beltz Verlag.
- Miettinen, J., Hooijer, A. [Aljosja], Vernimmen, R., Liew, S. C., & Page, S. E. [Susan E.] (2017). From carbon sink to carbon source: Extensive peat oxidation in insular Southeast Asia since 1990. *Environmental Research Letters*, 12(2), 24014. <https://doi.org/10.1088/1748-9326/aa5b6f>
- Miettinen, J., Shi, C., & Liew, S. C. (2016). Land cover distribution in the peatlands of Peninsular Malaysia, Sumatra and Borneo in 2015 with changes since 1990. *Global Ecology and Conservation*, 6, 67–78. <https://doi.org/10.1016/j.gecco.2016.02.004>
- Montello, D. R., & Sutton, P. C. (2006). *An introduction to scientific research methods in geography*. Thousand Oaks: SAGE. Retrieved from <http://www.loc.gov/catdir/enhancements/fy0657/2005028149-d.html>
- Normile, D. (2019). Parched peatlands fuel Indonesia's blazes. *Science (New York, N.Y.)*, 366(6461), 18–19. <https://doi.org/10.1126/science.366.6461.18>
- Paddock, R. C., & Suhartono, M. (2019, September 25). A Blood-Red Sky: Fires Leave a Million Indonesians Gasping: Wildfires burning across Indonesia have created respiratory problems for nearly a million people. *New York Times*. Retrieved from <https://www.nytimes.com/2019/09/25/world/asia/indonesia-red-sky-fires.html>
- Pinilla, V., & Willebald, H. (Eds.). (2018). *Palgrave studies in economic history. Agricultural development in the world periphery: A global economic history approach* (1st edition 2018). Cham, Switzerland: Palgrave Macmillan. Retrieved from <http://www.springer.com/978-3-319-66016-6>
- Rajendra Jadhav (2019, September 27). European crude palm oil prices to rise to average \$610/T in H1 2020 - analyst Mielke. *Reuters*. Retrieved from <https://www.reuters.com/article/palmoil-outlook-mielke/european-crude-palm-oil-prices-to-rise-to-average-610-t-in-h1-2020-analyst-mielke-idUSL3N26I2M7>
- Regenwald.org (2017). Erfolg: Palmöl-Lieferant von Unilever wegen Brandrodung auf Sumatra verurteilt. Retrieved from <https://www.regenwald.org/erfolge/8568/palmoel-lieferant-von-unilever-wegen-brandrodung-auf-sumatra-verurteilt>

## References

---

- Rotmans, J., Kemp, R., & van Asselt, M. (2001). More evolution than revolution: transition management in public policy. *Foresight*, 3(1), 15–31. <https://doi.org/10.1108/14636680110803003>
- RSPO 2020. Revision of RSPO Organic & Peat soil classification. Retrieved from <https://rspo.org/principles-and-criteria-review/revision-of-rspo-organic-and-peat-soil-classification>
- Schatzki, T. R. (1996). *Social practices: A Wittgensteinian approach to human activity and the social*. Cambridge: Cambridge University Press. <https://doi.org/10.1017/CBO9780511527470>
- Siegert, F., Ruecker, G., Hinrichs, A., & Hoffmann, A. A. (2001). Increased damage from fires in logged forests during droughts caused by El Niño. *Nature*, 414(6862), 437–440. <https://doi.org/10.1038/35106547>
- Sommer, B., & Schad, M. (2014). Change Agents for Climate Change Mitigation in Urban Areas Change Agents für den städtischen Klimaschutz. Empirische Befunde und praxistheoretische Einsichten. *GAIA - Ecological Perspectives for Science and Society*, 23(1), 48–54. <https://doi.org/10.14512/gaia.23.1.11>
- Spradley, J. P. (1980). *Participant observation*. Fort Worth: Harcourt Brace College Publ.
- Tacconi, L. (2016). Preventing fires and haze in Southeast Asia. *Nature Climate Change*, 6, 640 EP -. <https://doi.org/10.1038/nclimate3008>
- Temple, B., & Young, A. (2004). Qualitative Research and Translation Dilemmas. *Qualitative Research*, 4(2), 161–178. <https://doi.org/10.1177/1468794104044430>
- UNCTAD (2019). *VSS Assessment Toolkit: UNCTAD Project (DA-1617A1): Fostering the development of green exports through Voluntary Sustainability Standards*.
- Vincenzi, S. L., Possan, E., Andrade, D. F. d., Pituco, M. M., Santos, T. d. O., & Jasse, E. P. (2018). Assessment of environmental sustainability perception through item response theory: A case study in Brazil. *Journal of Cleaner Production*, 170, 1369–1386. <https://doi.org/10.1016/j.jclepro.2017.09.217>
- Vogel, C., Mathé, S., Geitzenauer, M., Ndah, H. T., Sieber, S., Bonatti, M., & Lana, M. (2020). Stakeholders' perceptions on sustainability transition pathways of the cocoa value chain towards improved livelihood of small-scale farming households in Cameroon. *International Journal of Agricultural Sustainability*, 8, 1–15. <https://doi.org/10.1080/14735903.2019.1696156>
- Warf, B. (Ed.). (2010). *Encyclopedia of geography*. Thousand Oaks, Calif: Sage Publications. <https://doi.org/10.4135/9781412939591>

## References

---

- Wim Giesen, & Eli Nirmala (2018). *Tropical Peatland Restoration Report: The Indonesian case*. <https://doi.org/10.13140/RG.2.2.30049.40808>
- Wit, F., Rixen, T., Baum, A., Pranowo, W. S., & Hutahaeen, A. A. (2018). The Invisible Carbon Footprint as a hidden impact of peatland degradation inducing marine carbonate dissolution in Sumatra, Indonesia. *Scientific Reports*, *8*(1), 17403. <https://doi.org/10.1038/s41598-018-35769-7>
- Wood, L. J. (1970). Perception Studies in Geography. *Transactions of the Institute of British Geographers*. (50), 129. <https://doi.org/10.2307/621350>
- Wösten, H., Hooijer, A. [Aljosja], Siderius, C., Rais, D. S., Idris, A. [Aswandi], & Rieley, J. (2006). Tropical Peatland water management modelling of the Air Hitam Laut catchment in Indonesia. *International Journal of River Basin Management*, *4*(4), 233–244. <https://doi.org/10.1080/15715124.2006.9635293>
- Yulmardi, Y., Amir, A., Erfit, E., & Junaidi, J. (2018). Where Is the Second Generation Nowadays? Evidence from Former Transmigration Villages in Jambi Province, Indonesia. *Open Journal of Social Sciences*, *06*(04), 282–293. <https://doi.org/10.4236/jss.2018.64024>

## Appendix

Table 1: List of all SAFA participants and qualitative interviews

#	Village	Function/ Occupation	Audio Y/N	SAFA Y/N	cultivated crop
1	Arang-Arang	Manggala Aggni	N	N	/
2	Arang-Arang	sh farmer	N	Y	Oil Palm
3	Arang-Arang	village official	N	N	Oil Palm
4	Arang-Arang	sh farmer	N	Y	Oil Palm
5	Arang-Arang	sh farmer	N	Y	Oil Palm
6	Arang-Arang	sh farmer	N	Y	Oil Palm
7	Arang-Arang	sh farmer	N	Y	Oil Palm
8	Arang-Arang		N	N	Oil Palm
9	Arang-Arang	sh farmer	N	Y	Oil Palm
10	Arang-Arang	sh farmer	N	Y	Oil Palm
11	Arang-Arang	sh farmer	N	Y	Oil Palm
12	Arang-Arang	sh farmer	N	N	Oil Palm
13	Arang-Arang	sh farmer	N	Y	Oil Palm
14	Arang-Arang	former Kepala Desa	N	N	Oil Palm
15	Arang-Arang	sh farmer	N	Y	Oil Palm
16	Mekar Sari	village official	Y	N	/
17	Mekar Sari	sh farmer	N	Y	Oil Palm
18	Mekar Sari	Kepala Desa	Y	N	/
19	Mekar Sari	sh farmer	N	Y	Oil Palm
20	Mekar Sari	sh farmer	N	Y	Oil Palm
21	Mekar Sari	sh farmer	N	Y	Oil Palm
22	Pulau Mentaro	teacher	y	N	/
23	Mekar Sari	sh farmer	N	Y	Oil Palm
24	Pulau Mentaro	teacher/ BRG	Y	N	Rubber
25	Seponjen	SH Framer/host/ BRG assistant	Y	Y	Oil Palm
26	Seponjen	sh farmer	N	Y	Oil Palm
27	Seponjen	sh farmer	N	Y	Oil Palm

Appendix

28	Seponjen	sh farmer	N	Y	Oil Palm
29	Seponjen	farmer	N	Y	Oil Palm
30	Seponjen	sh farmer	N	Y	Oil Palm
31	Seponjen	BRG employee	Y	N	/
32	Seponjen	workshop participant	N	N	/
33	Seponjen	sh farmer	N	Y	Oil Palm
34	Sogo	R3 participant, Buffalo breeding	N	N	/
35	Sogo	Paralegal	Y	N	/
36	Sogo	R3 participant, Pandan weaving	Y	N	/
37	Seponjen	sh farmer	N	Y	Aracca Nut
38	Sogo	R3 participant, Pandan weaving	N	Y	Rice
39	Seponjen	sh farmer	N	Y	Oil Palm
40	Sungai Bungur	Environmental activist	Y	Y	/
41	Sungai Bungur	sh farmer	N	Y	Oil Palm
42	Sungai Bungur	sh farmer	N	Y	Oil Palm
43	Sungai Bungur	sh farmer	N	Y	Oil Palm
44	Pematang Rahim	sh farmer	N	Y	Oil Palm
45	Pematang Rahim	sh farmer	N	Y	Oil Palm
46	Pematang Rahim	sh farmer	N	Y	Oil Palm
47	Pematang Rahim	sh farmer	N	Y	Oil Palm
48	Tangkit Lama	sh farmer	N	N	Pineapple
49	Jambi	UNJA Professor	Y	N	/
50	Gedong Karya	sh farmer	Y	N	Oil Palm
51	Gedong Karya	sh farmer	Y	N	Oil Palm

*Table 2 T-Test Values of the SAFA-Villages*

<b>Village</b>	<b>Mean</b>	<b>T-Value</b>	<b>Significant diff.</b>
Arang-Arang	Non-DPG- Villages	0,82	No
Mekar Sari	Non-DPG- Villages	0,66	No
Seponjen	DPG- Villages	0,90	No
Sogo	DPG- Villages	0,84	No
Sungai Bungur	DPG- Villages	0,89	No
Pematang Rahim	DPG- Villages	0,95	No

## Interview Summaries

This Interviews have been summarized by the research assistant and are here presented unchanged

### **Interview #40**

We met I #40 in the village office after the village meeting was over. I #40 is the village consultative body head (*Ketua BPD*) of Sungai Bungur. He was born and grew up in the village. He takes part in BRG as a paralegal. He was chosen as the national head of paralegal association involving 7 provinces in Indonesia including Jambi, Riau, Palembang and 4 other provinces. He graduate from STAI Jambi for Diploma 2 program. He used to be an Elementary School teacher for 5 years from 2005 – 2010.

### **Changes**

As what he observes, he notices that there are some significant environmental changes including water and soil condition. Comparing now and back to 2007/2008 the soil fertility is decreasing. The water source, Batanghari - Sungai Kumpeh, is contaminated by factories waste. Many plots of land now are converted by the company. He said that as time goes by the factories destroy the soil and water condition. It can be seen from the flood trail marked as red or yellow. The flood used to leave no color previously. Kind of good news for the downstream area that flood leave new sediment which is kind of good for farming, however, it actually degrades the remaining substances of the soil.

He also notices soil degradation in his land about 30 – 40 cm within a year. It can be seen from the lower part of the oil palm tree. When it first planted it was under the ground later it comes up, means the soil goes down. He said that the peat in the resident area is consider shallow peat only up to 50 cm which still able to be cultivated. The peat in TAHURA or National Park is considered deep peat.

There are three companies around the area including MAKIN Group, EWF (Era Wira Forestama)/Akiang, CV Bang lai. MAKIN Group is part of Puri Hijau Lestari. It has Plasma-Inti scheme. Bang Lai is a personal company.

### **Paralegal**

Paralegal is a volunteering job without any payment. Basically, BRG concerned about Environment and society livelihood within peatland area. However, BRG also found that land conflict is also part of problem which frequently happen around peatland area. Hence, BRG initiated to educate peatland society to be able to participate to solve the problem of land conflict. 2 people from each village of Peatland Care Village (Desa Peduli Gambut) were chosen to represent the villages. Once from BPD and another one from the local youth.

Last 2017, I #40 was trained about legality in Jambi and in some areas out of Jambi. In 2018, he attended a workshop at the forestry office of Riau. Later, there was follow up short training at Bogor which he has to attend to receive the certificate of being a paralegal. At the workshop, there was a sharing session with person from the ministry of law and human right

and lawyers from all around Indonesia about legal basis of being a paralegal. There were some verse in the constitution stated that paralegal could only argue in the field instead of in the court. Paralegal cannot replace the position of lawyer at the court due to academic background. In fact, paralegal was only trained shortly hence it was considered not capable enough to speak in the court. Paralegal is counted as partly lawyer.

All of the paralegal around Indonesia is united under an association called *Perkumpulan Paralegal Masyarakat Gambut Indonesia* (PPMJI). The office located next to Badan Inteligent Negara (BIN) office at Jakarta. PPMJI are supported by Epistema Institute and NGO from Nederland.

I #40 was chosen because he was the BPD head of the village. There were actually two options of training programs which he could take including paralegal and negotiator. He took paralegal program because he thinks that it is interesting. He is motivated to learn more about law because indeed there are a lot of law cases happen in the village and the society is not well-informed how to deal with the case. He took a small example about case retraction. Whenever there is a criminal case reported to the police and it is cancelled. There is nothing called case retraction fee, nothing has to be paid to withdraw the report and stop the investigation. However, the common knowledge spread over the society is an expensive payment of case retraction.

The thing I #40 worries about is his family. He refers family to all of the villagers living in Sungai Bungur. In case, his family face a legal problem, he could help to solve it with proper knowledge. He does not want some particular parties take benefit from the naive villagers.

He also actively share his knowledge to the villagers through informal light sharing session by chance. The topic mostly discuss is about land conflict but there was also some people want to know about other kind of legal case.

### **Woman empowerment program**

In the middle of the interview, he told us that Sabki, the our guide, might be also well-informed about BRG program. He attended BRG workshop quite often related to woman empowerment program. It was a creative industry program, in particular, pandan weaving.

I #40 thinks that this program is actually good. It basically aims to be dual functions, increasing the society income and preserving the peatland in the same time by managing the pandan cultivation. However, the program is a seasonal program. He thinks that it suppose to be a sustainable program.

### **Workshop Experiences**

He started to be exposed by environmental knowledge and being an environmental activist from 2012. That year, He joined WALHI NGO. At the same year, he joined Peatland society network Jambi (*Jaringan Masyarakat Gambut Jambi*). He joined BRG in 2016. He has attended more than 10 workshops about environmental issue.

### **Paludi Culture**

He never heard about paludiculture however he can slightly relate with the defenition which is cultivating peatland adapted commodity in between peatland forest means having economic

benefit and preserving the peatland at the same time. He said that there was an idea about it but it has not yet been executed which is *Hutan Desa* Scheme. Plots of land in the peat Production Forest area was proposed to *Hutan Desa*.

### **Peatland Management**

The term “*gambut*” is actually a new thing for the society in the village. However, the peat itself has existed and been part of society life from the very first place. People just called it with a different name which is “*kasang kering*”. Society never drains the peat. What is happening nowadays, huge canals are established which is actually over-sized the regulation. Society uses small canals to decrease the water level of the peat to make it less swampy. The existing drained peatland is commonly belongs to company's land. He thinks that society has wisely managed their peatland. They use controlled land burning as part of their local wisdom.

### **Green House Gas Issue**

I #40 explains that the greenhouse gas emission occurs due to the peatland heat. When the peatland gets dry, the substances from the soil evaporate and release carbon to the atmosphere. He thinks that it happens because of the large-scale of peatland drainage mostly done by the company instead of the smallholders. He added that basically the environmental problem happens because people tend to manage the land based on what people needs (focusing on profit) instead of what is actually needed by the peatland (focusing on the good practice of peatland management).

He said that GHG emission has just become a trending issue in Indonesia after the severe forest fire last 2015. The fire was not only damage the environment but also damage the public health. He is so much sure that the company took major part on this land fire. He also thinks that one of the reasons why many countries such as Malaysia, Singapore and America put their attention on this carbon emission and fire case is because they invest on our land, our land is actually their asset which has to be protected.

### **Peatland knowledge**

I #40 has been living in the peat land area for whole of his life. He got used to peat land management. He gains a lot of new information about peatland and environment through many trainings he attended from BRG and NGOs. However, the trainings did not change his perception toward peatland and peatland management practice.

We met I #40 in the village office after the village meeting was over. I #40 is the village consultative body head (*Ketua BPD*) of Sungai Bungur. He was born and grew up in the village. He takes part in BRG as a paralegal. He was chosen as the national head of paralegal association involving 7 provinces in Indonesia including Jambi, Riau, Palembang and 4 other provinces. He graduated from STAI Jambi for Diploma 2 program. He used to be an Elementary School teacher for 5 years from 2005 – 2010.

### **Changes**

As what he observes, he notices that there are some significant environmental changes including water and soil condition. Comparing now and back to 2007/2008 the soil fertility is decreasing. The water source, Batanghari - Sungai Kumpeh, is contaminated by factories waste. Many plots of land now are converted by the company. He said that as time goes by the factories destroy the soil and water condition. It can be seen from the flood trail marked as red or yellow. The flood used to leave no color previously. Kind of good news for the downstream area that flood leave new sediment which is kind of good for farming, however, it actually degrades the remaining substances of the soil.

He also notices soil degradation in his land about 30 – 40 cm within a year. It can be seen from the lower part of the oil palm tree. When it first planted it was under the ground later it comes up, means the soil goes down. He said that the peat in the resident area is consider shallow peat only up to 50 cm which still able to be cultivated. The peat in TAHURA or National Park is considered deep peat.

There are three companies around the area including MAKIN Group, EWF (Era Wira Forestama)/Akiang, CV Bang lai. MAKIN Group is part of Puri Hijau Lestari. It has Plasma-Inti scheme. Bang Lai is a personal company.

### **Paralegal**

Paralegal is a volunteering job without any payment. Basically, BRG concerned about Environment and society livelihood within peatland area. However, BRG also found that land conflict is also part of problem which frequently happen around peatland area. Hence, BRG initiated to educate peatland society to be able to participate to solve the problem of land conflict. 2 people from each village of Peatland Care Village (Desa Peduli Gambut) were chosen to represent the villages. Once from BPD and another one from the local youth.

Last 2017, I #40 was trained about legality in Jambi and in some areas out of Jambi. In 2018, he attended a workshop at the forestry office of Riau. Later, there was follow up short training at Bogor which he has to attend to receive the certificate of being a paralegal. At the workshop, there was a sharing session with person from the ministry of law and human right and lawyers from all around Indonesia about legal basis of being a paralegal. There were some verse in the constitution stated that paralegal could only argue in the field instead of in the court. Paralegal cannot replace the position of lawyer at the court due to academic background. In fact, paralegal was only trained shortly hence it was considered not capable enough to speak in the court. Paralegal is counted as partly lawyer.

All of the paralegal around Indonesia is united under an association called *Perkumpulan Paralegal Masyarakat Gambut Indonesia* (PPMJI). The office located next to Badan Inteligent Negara (BIN) office at Jakarta. PPMJI are supported by Epistema Institute and NGO from Nederland.

I #40 was chosen because he was the BPD head of the village. There were actually two options of training programs which he could take including paralegal and negotiator. He took paralegal program because he thinks that it is interesting. He is motivated to learn more about law because indeed there are a lot of law cases happen in the village and the society is not well-informed how to deal with the case. He took a small example about case retraction.

Whenever there is a criminal case reported to the police and it is cancelled. There is nothing called case retraction fee, nothing has to be paid to withdraw the report and stop the investigation. However, the common knowledge spread over the society is an expensive payment of case retraction.

The thing I #40 worries about is his family. He refers family to all of the villagers living in Sungai Bungur. In case, his family face a legal problem, he could help to solve it with proper knowledge. He does not want some particular parties take benefit from the naive villagers.

He also actively share his knowledge to the villagers through informal light sharing session by chance. The topic mostly discuss is about land conflict but there was also some people want to know about other kind of legal case.

### **Woman empowerment program**

In the middle of the interview, he told us that Sabki, the our guide, might be also well-informed about BRG program. He attended BRG workshop quite often related to woman empowerment program. It was a creative industry program, in particular, pandan weaving.

I #40 thinks that this program is actually good. It basically aims to be dual functions, increasing the society income and preserving the peatland in the same time by managing the pandan cultivation. However, the program is a seasonal program. He thinks that it suppose to be a sustainable program.

### **Workshop Experiences**

He started to be exposed by environmental knowledge and being an environmental activist from 2012. That year, He joined WALHI NGO. At the same year, he joined Peatland society network Jambi (*Jaringan Masyarakat Gambut Jambi*). He joined BRG in 2016. He has attended more than 10 workshops about environmental issue.

### **Paludi Culture**

He never heard about paludiculture however he can slightly relate with the defenition which is cultivating peatland adapted commodity in between peatland forest means having economic benefit and preserving the peatland at the sametime. He said that there was an idea about it but it has not yet been executed which is *Hutan Desa* Scheme. Plots of land in the peat Production Forest area was proposed to *Hutan Desa*.

### **Peatland Management**

The term “ gambut “ is actually new thing for the society in the village. However, the peat itself has been existed and being part of society life from the very first place. People just called it with different name which is “ kasang kering “. Society never drains the peat. What is happening nowadays, huge canals are established which is actually over-sized the regulation. Society use small canal to decrease the water level of the peat to make it less swampy. The existing drain peatland is commonly belong to company’s land. He thinks that society has wisely manage their peatland. They use controlled land burning as part of their local wisdom.

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I #40 explain that the green gass house emission occurs due to the peatland heat. When the petland getting dry the substances from the soil evaporate and release carbon to the atmosphere. He thinks that it happens because of the large-scale of peatland drainage mostly done by the company instead of the smallholders. He added that basically the environmental problem happen because people tend to manage the land based on what people needs (focusing on profit) instead of what is actually needed by the peatland (focusing on the good practise of peatland management).

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### **Peatland knowledge**

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### **Interview # 51**

I #51 is one of two representatives of Gedong Karya village joining a workshop from BRG. Pak Arief, our host, took us to his house in the afternoon of our first day arriving in Gedong Karya.

### **Daily activities**

I #51 is 28 year old man. He is originally from Central Java. He came to the village last 2009 following his parents. He works for PT ADS company as a daily worker harvesting the oil palm fruits. After working in the company's plantation he goes to his land doing food crops and vegetable farming including cassava, spinach water, long bean, and water melon. He does farming on both mineral land and a half ha of semi-peatland. The peat was only a half meter deep.

### **Workshop**

He joined workshop about organic fertilizer making from BRG. He got a lot of new insight about the organic fertilizer. Even though he has been able to make organic fertilizer and applied it on his land for some years before the training. He said that the organic fertilizer can cut the fertilizer expense as much as 70 percent and increase the production as much as 60%.

He showed us his organic fertilizers made from rice, fruits and animal dung. [You can cross check the information the is not typed here with those on your note. I did not write on my note and we did not record it but I translated to you, the talk we had with him when he was showing us his works outside of his house]

I #51 looks so into the organic fertilizers. He wants to learn more about it. He expects to attend more workshop about organic fertilizer. He has no idea if there was other kind of workshop conducted by BRG. He is actually thinking about sharing his knowledge about organic fertilizer to the community but has not done it yet.

### **Peatland problem**

The only problem he notices happen in peatland area is the acidic condition of the soil. He has no problem with fire. BRG workshop did not change his perception about peatland. He use dolomite to neutralize the acid in the peat soil. The subsidised price of dolomite is IDR 25.000/sack and the non-subsidised one is IDR 75.000/sack. He has been using dolomite since the first time he was doing farming on peatland, last 2 years. He knows how to use dolomite from his friend who are also doing farming.

He has no idea about global climate change. He thinks that when the peat is dry the soil will be degraded. When the rain falls and flooded the peatland it will re-new the soil and create a better soil.

After 2 days living in Mekar Sari, we got information from an article on the internet about running BRG program in Jambi. We decided to find more information in the neighbouring village, Pulau Mentaro, which was mentioned in the article. It located next to Mekar Sari, 15 minutes riding to the main road. We went to the village office in the afternoon but nobody was there. The next day, we went to the office again in the morning and we met some people, village stakeholders. We talked to somebody which I don't remember the name. He was one of the village stakeholder. We had short talk about any programs running in the village waiting for somebody else we wanted to talk to.

### **Aqua-culture program**

Previously, there were aqua culture programs in the village including fish and eel. There were some groups having eels, however it was not really successful. He thinks that it was because of technical errors both climate which is not suitable for the eel breeding and the wrong seeds preference which was not adapted to the local living condition. There were some people harvested the eels but not really successful and some others experienced harvest fails. The program was in 2014. Now it is no longer exist. Society submitted a program proposal to fishery office and it was approved and funded.

The fish culture was done in the oil palm plantation. Farmers have got water ponds in somewhere in the field. The water is used for fish culture as well as as water source whenever the forest fire start again.

There was a plan to run an integrated oil palm plantation-cows breeding. Means, the cows can feed themselves in the plantation and the manure from the cows can be applied in the

plantation. However, it has not been realized yet. There was a program of cows breeding but it is not yet integrated with the farming activity. Farmers has not used the manure as the fertilizer yet. The program was not part of BRG program. The cows breeding existed around 10 years ago. It was the program from animal husbandary office.

We actually read an article :

“ Setelah menyaksikan Penandatanganan Surat Perjanjian Kerjasama Swakelola (SPKS) Tahun 2019, di Aula Desa Betung. Kepala BRG didampingi Bupati Muaro Jambi Hj Masnah Busro, Kepala Dinas Kehutanan Provinsi Jambi, A Bestari, Dir Reskrimsus Polda Jambi Kombes Pol Tinta Boeru, dan Kapolres Muaro Jambi AKBP Mardiono, serta Lambok Iswandi Panjaitan, Pendamping Sekat Kanal di Desa Seponjen, melihat langsung Revitalisasi sosial ekonomi masyarakat melalui **bantuan ekonomi produktif masyarakat desa gambut yaitu penggemukan dan budidaya sapi, di Desa Pulau Mentaro Kecamatan Kumpeh Kabupaten Muaro Jambi**, asal dari APBN 2018 pada Kelompok Masyarakat Fullmen Jaya.”  
[<http://jambidaily.com/detail/demi-memaksimalkan-restorasi-gambut-dan-revitalisasi-ekonomi-brg-ri-temu-wicara-ke-muaro-jambi/>]

That we assumed that the economic revitalization program of BRG has been running and progressing in this village. However, the village stakeholder we talked to said that there has not been any program from BRG and he just known from us that BRG has program in the village [It was kind of weird but maybe he was less informed about what was happening in the village]. He said that there was not socialisation about BRG program to society. Society barely knows anything about the BRG programs.

### **Society perception about Peatland Restoration**

He said that society thinks that peatland restoration program is a good program due to the forest fire. Society concerns and worries a lot about the fire. They think that by having cannal blocks and drilling well, they could access the water source to get rid of the fire easier. He thinks that not only society who concern about the fire but also the government. He thinks government responds and spends huge amount of budget to extanguish the fire by having many helicopters bringing the water.

Mekar Sari was not on fire last 2015 because there was no peat forest land. But the helicopters took the water from the village. People in the village feel the impact of the haze anyway. There was a fire fighter killed during his work extanguishing the fire.

### **Interview #24**

We met I #24 late in the afternoon. He lives in front of the village office of Pulau Mentaro. I #24 is 34 years old man. He graduated from Jambi University for his bachelor study taking Physical Education Teaching. He finished three year diploma program in 2008 then he 2 took years bachelor program in 2010. He was born in the village. He works as a sport teacher in a vocational high school, SMK 5 Puding village. Apart from his job as a teacher, he is also a farmer. He has 1 ha of mineral rubber field in Pulau Mentaro. He works tapping the rubber by himself. He also has 2 ha of bare peatland. He did corn farming but it was attacked by pigs, hence he left the land bare.

## BRG Program

So far, BRG project will be conducted until 2020. In Jambi, BRG programs have been running in three regencies including West Tanjung Jabung, East Tanjung Jabung and Muaro Jambi. I #24 has ever exposed about 3R program of BRG. He thinks that all of the programs aim to prevent and reduce the forest fire cases and to establish society awareness to protect the peatland.

He explains that R1 (Rewetting) is a good program. He mentioned that huge size of peatland is in the area of TAHURA (*Taman Hutan Raya*). It is special area which cannot be planted by either company or smallholder farmers. The area has function as water absorption area. Once it is drained it will not be able to preserve the soil water level any longer. He thinks that rewetting the land is a great idea to reduce possibility of the forest fire. [He refers rewetting project to the area of TAHURA. But he said that TAHURA was not drained because it is remained natural swamp peatland. So, I don't think that he really understand about rewetting program]

He doesn't not really know about peatland revegetation program then I was explaining a little bit that revegetation, R2, means re-planting the damaged peatland with peat land commodities, in which oil palm is not part of them. He thinks that changing the current planted plants, oil palm, is okay as long as the market is available. He explained that previously cocoa used to be the featured product of the village. One farmer could produce 500 kg to 1.000 kg of cocoa. Today, less people cultivate cocoa due to the pest attacks including pigs and fruit flies. They changed the cocoa to oil palm.

R3, economic revitalization program is a very good program. It has been conducted in the village of Pulau Mentaro, Betung, Pematang Raman, Seponjen, Sungai Bungur, and Tanjung. I #24 is the leader of economic revitalization program of BRG in the village of Pulau Mentaro. The program is cows breeding. The cows breeding was under the supervision of forestry and regional development planning agency started from the end of 2018. There were 12 cows given to a group in the village consist of 15 people. The leader of the group is in charge to organize the team submitting program proposal to the central BRG. At first, BRG offered possible program to the society then society has to propose the program.

Society of Pulau Mentaro preferred to have cows compared to either goat or buffalo. I #24 said that it is quite difficult to take care of the buffalos and the goats because buffalo needs swamp area to live and goat is not easily adapted to the local weather. Cows breeding is the least risky option. The cows were also insured. I #24 explained that the aim of the cows breeding program is to encourage people not to burn the land. He said that, instead of burning the grass in the field, people can use the grass to feed the animals by doing animal breeding. BRG also wants to embrace people to be aware and actively participate to deal with forest fire issue.

BRG conducted some trainings related to cows breeding including how to select good calf to be bred and how to make the cowshed. Also, the issue of good governance of the group and proposal making were discussed in the training.

Deep well is also one of BRG program in this village. The deep well is used to re-wet the field. The nature of peatland is prone to be burn whenever it is overheat. I #24 said that in a certain the it can be totally burn within 1 hour only by cigarettestub. When the fire started it is hard to

stop. The water source is also quite far. The nearest one is about 200 meter. Thus, by the existence the deep well, the water source can be closer around 1 – 50 meter from the fire.

The zero burning policy affected the farmers activity. The forest fire is monitored by the satellite. Hence, less people burn the field now. I #24 said that people now afraid of the policy. However, it is not really zero burning. There are still some people burn the field but they manage it well that the fire will not turn huge.

### **Peatland and environmental changes**

I #24 said that the environment changes a lot. Forest has been degraded. The water absorption becomes less. Large area of forest has been cleared and turned to plantation. Mostly in the area of company land and its surrounding. The peat in the area of Pulau Mentaro is quite deep, 2 – 3 meters. Now, the peat has been degraded. In his peatland farm, 2 meters deep, the soil is degraded about 20 cm. He said that the degradation is due to land fire and flood. He said that flood occurs due to deforestation. Once, there were a lot of swamp peatland. Later, it was drained and planted oil palm. Thus, the land became drier. He said that the peatland apart from TAHURA should also be taken care.

### **Peatland commodity**

I #24 thinks that on the shallow peatland banana and pineapple are good to be cultivated. Pineapple does not intake huge amount of water. Once, there was grant including pineapple, banana dan duku seeds given by forestry ministry office and BRG.

### **Government policy**

I #24 said that the aim of BRG and Forestry ministry aim to protect the peatland by preventing the over exploitation of peatland. In fact, there has been a policy that peatland cannot be exploited any longer. However, in practise, company permit still work. It might be because the permit has been issued for some number of years long before the peatland exploitation is disallowed. He has ever complained to forestry office on behalf of society about the forest exploitation system but it did not really work.

### **TAHURA**

The nearest TAHURA from the village, around 27 km, located in Tanjung village. It is coterminous with PT.BBS (*Bukit Bintang Sawit*). I #24 thinks that preserving TAHURA is good thing. Otherwise, the natural swamp ecosystem will be destroyed. However, it is less possible to extend the area because most of the remaining land has been managed either by company or smallholder farmers. Also, it is complicated to take over the area from the companies because they have had the land permit. There are many companies located around TAHURA including Makin Group, BBS, SNP (*Sumbertama Nusa Pertiwi*). The water level of Tahura this year has been lower than in 2012. I #24 told that there was a survey conducted by forestry office measuring the water level of the peatland in TAHURA. It might be because of deforestation that there is less water preservation area.

### **Land Fire**

Land fire becomes problem in the village. Hence, society feels great to have deep well and canal block programs in the village. I #24 said that canal blocks works to maintain the water level in the canal so it will not drain or becomes shallow. It also works as water sources to get rid of fire whenever land fire starts. 3 years ago, the land fire occurred within 3 days and 3 night. It was about 15 km from Pulau Mentaro to Pematang Raman. Everyone worked together hand in hand getting rid of the fire. It is also become one of the reason he went complaining to the forestry office. His land was part of those in fire.

There was once an idea about tower fire project in the village of Puding and Pulau Mentaro. It was a program from forestry office cooperated with Jambi University. The observation has been conducted. However, there was no follow up actions. It was about 2 – 3 years ago.

### **Training from BRG**

There were some trainings conducted by BRG about peatland management and forestation training. There was also timber tree seedling given by the BRG to be planted around the farmer plantation as the field fence to protect the field from fire. He attended some trainings but he did not have the printed materials. He has no idea about GHG emission.

### **Interview #16**

We met I #16 when we first arrived in Mekar Sari office. It was quite messy at first because we just informed the village head in the morning we were heading to Mekar Sari. Thus, the village stakeholders were kind of thinking where to take us for the night stay. I #16 handled us well. He was calling some people trying to find out the possible place for us. Surprisingly, after talking here and there, we found out that he and his family are actually living in my neighbourhood in Jambi City, somewhere behind Simon and Son. What a small world !

I #16 was in charge as the head of development affairs in the village of Mekar Sari. He and his wife now live in the village. He has 10 Ha of land including 6 Ha of mineral land and 4 Ha of peatland, 1 – 2 meters deep. Almost all of the land is oil palm plantation, only about 10 % is rubber plantation.

### **Peat land story**

I #16 thinks that managing peatland is environmentally risky whenever it does not use the appropriate peatland management technology, for example digging the canal without a right knowledge on the calculation. In fact, if there were too many canals it would drain the field too much. Hence, it will be prone to the land fire. I #16 thinks that not everyone aware about it. People tend to take the easiest way to manage the land with no concern about the negative impact of their practises.

The access to information has existed. The official village extension service agent has worked well. The official fire station and forest fire control brigade, Manggala Agni, also work educating people about forest fire. Most of the villagers have been exposed to the knowledge however

not all of them aware to do the good farming practises. Hence, the main problem occur on peatland right now is land fire.

Peatland located in the low land area. Actually, if it is seen from the water condition, peatland is good as the water reserve. It is good for oil palm because oil palm needs a lot of water to grow. However, It absorb huge amount of soil water so it leads to the problem of drought. The soil condition and the acidity of the peat does not really suitable for oil palm. The soil cannot support the trees which is why many of the oil palm trees grow on peatland are not straightly grow. When the heavy wind hit the trees somehow they tip over. The fruit production is also less compare to the oil plam growing on the mineral land. Some oil palm trees over 15 years sometime break in the middle of the tree. I #16thinks that it is because of the improper usage of fertilizers.

Within the dry season the water level in the cannal is between 1,5 – 2 m from the land surface. Within the rainy season the water level in the cannal can be as high as the land soil. I #16thinks that the water level in the cannal suppose to be between 40 – 50 cm in which the peatland is still wet. It could only happen in the rainy season.

Peatland soil degradation happens due to the land processing. Around Pak Sumardi's house the peat degraded from 1 meter to only 5 cm left. In the field, which has been cultivated for 15 years, the peat degraded from 2 meter to a half meter left. I #16thinks that the soil degradation occurs because people keep tilling and stepping on the soil. Thus it turns to very small particles and eroded by the wind.

Talking about the idea of peatland restoration, I #16thinks that completely rewetting the peatland by having cannal blocks is a good idea to preserve the peatland ecosystem. He said that when the swamp area exist people can hear the frogs sounds in the area. In dry season the cannal blocks are closed thus the water in the cannal will remained to wet the land. Once the cannal blocks are opened, the water will go into the peat and keep the peat wet.

However, making the peat a swamp again, people have to change the crops to food crops again instead of cultivating oil palm. Saturated peatland will increase the acidity of the soil. Oil palm cannot survive on the high acidic soil. I #16thinks that it is less possible for people changing the oil palm to food crops again. Because after cultivating oil palm the soil cannot directly adapted for food crops cultivation. It has to be left bare and wet for some years to prepare the soil to grow food crops.

Basically, food crops are more environmentally friendly than oil palm. However, because of the social economic jealousy people prefer to grow oil palm to food crops. Also not all villagers are lack of knowlege about the issue of environment. There are also some academics living in the village. It is all about the awareness and personal preference. When people tend to choose between saving environment and having more prosper living. Naturally, most people will take prosperity as their first consideration.

### **BRG Story**

BRG has been came to the village in 2018. People from BRG introduce BRG program and had discussion with the village stakeholders. The program was related to fire prevention and fire mitigation including cannal blocking and deep well. There has been no exposure to the society yet about BRG program. The program has not been running.

### **Mekar Sari story**

People in Mekar Sari used to do food crop farming in 1986. Oil palm started to be cultivated in the village in 1992/1993. Later, the massive planting started in 1994. Mekar Sari used to be transmigration area. The transmigrants got some amount of land for food crops farming. However, looking at other villages such as Sungai Bahar which grows and develops better than Mekar Sari due to oil palm cultivation. People of Mekar Sari decided to start growing oil palm as well. Not only because of economic reason but also considering long term investment. I #16 said that people do not think that they are going to go doing food crop farming every single day whole of their life. They did not have tractor yet. Hence, cultivating oil palm is a much better idea.

The oil palm plantation in Mekar Sari is smallholder projects. There was no aid from government. The canal blocks have existed before the oil palm cultivation started. The government under general development office taking care of the canal blocks.

### **Interview 22**

We met I #22 at the office of Pulau Mentaro. He is a 29 years man who is in charge as the lead of one of BRG program which is deep well project. He was born in Desa Pulau Tigo, part of Seponjen, in 1990. He moved to Pulau Mentaro 21 years ago when he was an elementary school student. He completed his bachelor degree at Jambi University taking Physical Education program.

Currently, he works as a contract field staff of PKH program (*Program Keluarga Harapan*). It is a program from Sosial Ministry of Indonesia. His works basically distributing the aid from the government to the villagers in the area of Kumpeh. The aids are mostly related to children education, public health, and elderly prosperity. He is not a civil servant. In addition, he is also in charge as the lead of MPA (*Masyarakat Peduli Api*), fire care community. MPA does fire patrol.

### **BRG Story**

BRG programs implemented at Pulau Mentari by the end of 2018. The programs were deep well and economics revitalization. There have been 16 deep wells built in Pulau Mentaro. There should be up to 40. The remaining 24 were on process. Deep wells are built to deal with land fire problem.

Pulau Mentaro is prone to be burned both naturally burned due to the drought season and man made fire. Thus, by having the deep wells there will be sufficient water source to deal with it. The location of the deep well is far to the other side of the river that we could not go there to have a look. The peat in that area is 3 meter deep. The deep well was drilled up to 40 meter however in many cases in the deep of 26 to 30 meters water has been found.

The revitalization program was cows breeding project. There have been 12 cows given by BRG to a farmer group. There are basically 2 programs of the cow breedings. Cows feeding

and cows breeding. Currently, it is focus on the feeding instead of the breeding. There has been no cow is sold.

BRG also conducts training supporting the program. However, the training was more about the administrative things such as how to create proposal and how to make program reports. There have been no training related to the program application. Peatland education was delivered to the society but not in depth discussion, only as the introduction part. The program of BRG are run by the people in the village. The lead of the program is in charge as the coordinator who lead the people in the village running the program. The expert and the technician are provided by BRG. Thus, BRG is also supervising the program.

### **Peatland Story**

Once he moved to Pulau Mentaro, the area was still peat swamp area. Now, it has been drained by digging canals to be able to plant oil palm trees. He thinks in general, draining the swamp area is good that people can cultivate the land otherwise they could not. However, it leads to the problem of land fire. The drained peatland is prone to be burn. If there have been no deep well it would be difficult to get rid of the fire due to lack of water source.

Oil palm is actually contribute a lot draining the soil. The peat land became drier because oil palm takes huge amount of water to survive. Thus, people wet the soil in the dry season by pumping the water from the well and spread it over the soil. The distance between the wells are 200 meter the hose is 100 meter long.

Many of the forest area which built by the company are burned. The area of Pesona Belantara Persada, a timber company and MAKIN Group. PT Pesona Belantara Persada has no land in the village area but it close to the village. Many of the oil palm plantation in the area are plasma area. The peatland are drained by canal system. Today, there is no more natural swamp area in the village. The company has existed long ago even before he moved to the village. He knows that once he recognized one big personal company called Haji Busro (I think Haji Busro is a big oil palm trader which has been legal running as a company) Later other company came.

Some peatland plots of oil palm are also planted by smallholders. Some other cultivate rice, corn and other food crops. But there is no canal built in the plantation area. Thus, water source is quite far from the field. It is difficult for the farmers to access the water in particular within dry season. In the other side, the field will be flooded in the rainy season. There is no issue that there will be canal built. I #22 has no peatland field. He only have mineral farm land. He cultivates corn on it.

Hediansyah notice no problem on peatland but land fire. He has no idea about carbon emission and climate change. Most people has felt comfortable cultivating oil palm that they do not want to change oil palm to other commodity.

**The last 20 minutes of the interview, another man sitting with us at the office took over answering our question.**

### **Problem in the village**

He thinks that the current problems happen in the village is related to infrastructure and flood control. He thinks that there should be better road contraction. Also related to the operation of timber company which still hold permit from the government to work taking the trees in the forest area close to the village.

He said that people in Pulau Mentaro hope that the BRG program will be well executed in the future. Related to peatland education, not many people understand about cannal block and its function. However, the idea of cannal block has existed withing the villagers in different words. People commonly call cannal block establishment as “ *pembuatan parit* ”

Climate change has been felt by society. They are aware that the dry season becomes hotter than before. They also cannot predict the season any longer. Thus, the harvest season become unpredictable.

### **Interview 31**

I #31 is a BRG facilitator working in Sungai Aur village. He has been working for BRG for two years. We met him at the village office of Seponjen.

#### **BRG Programs**

In general BRG has got 3 programs including peatland Rewetting, peatland Revegetation and Economic Revitalization. Peatland rewetting is done by establishing cannal blocks to preserve the water level. Cannal blocks program has been running in Sungai Aur. Some people thinks that it is a good idea and some others think it is not because once the cannal blocked closed the peatland will not be dry hence people cannot do farming well on the swamp land.

For the economic revitalization, There was a workshop about processing peatland vegetation such as *eceng gondok* (water hyacintha), *Pandan*, and *Rumbai* to a useful products including mat or some kind of furnitures. Society in Sungai Aur was excited about the workshop. They did not know that peatland vegetation can be economically potential. They were excited because it was a new things for them. They wanted to have the next similar workshops. There has been one workshop conducted in Sungai Aur. Another program is animal husbandaries including ducks, goats, and cows.

I #31 thinks that those three programs have their own advantages and disadvantages. He thinks that before conducting the programs, people has to be educated, in particular, those who directly in touch with the programs. People have to be informed if their current practises on peatland such as land burning is kind of risky. However, without giving proper information to society, they are always blamed. In fact, the policy of giving permit for company to manage peatland is basically problematic.

Also, It only reaches some part of society due to the lack of human resource and funding. The program only run by a community group (*PokMas/Kelompok Masyarakat*). BRG also does not involved village stakeholders that much into the program. In addition, BRG does not provide sufficient knowledge about the program, in particular for animal husbandary programs. The

program run without proper information about the animal management including animal health care. I #31 thinks that there should an expert like a vet in charge to be part of the program.

People are not really aware of the environmental issues. Some people are concern about it but some others are not, depending on their personality and their current mood. There has been not many workshops about the environment. The workshops mostly conducted by NGO. I #31 also thinks that BRG has to be proactive to encourage people to do the post training activity. BRG cannot expect people to have an initiative to start the application of the knowledge they got from the training. Because they have their own business with their life and they did not see enough urgency to initiate the activity. Also, I #31 sees that BRG does not involved people that much in the program in particular those who live close by the peatland forest (TAHURA).

Hence, people don't really feel the connection with the nature. In can be seen that when TAHURA was on fire last 2015, people did not feel they had to do something significant to deal with it because they had nothing to do with TAHURA. I #31 thinks that actually if people cannot manage the TAHURA land personally, it can be managed to be a community forest under partnership scheme. There are many people visiting TAHURA for having a research, excursion or only want to have a look. However, this potency does not manage by anyone.

One of the program conducted by BRG is community assistance on field based learning. It was about natural fertilizer and manure making it is organized by village-owned business (*BumDes*). In West Tanjung Jabung, the fertilizer making grow significantly that they have do it commercially. Then, there is also a program to educate people about peatland knowledge such as managing the land without fire. BRG also start to enter the formal and non formal education by putting the peatland knowledge to school lesson material, educating the elementary teacher. It will be included to the elementary school curriculum later in 2020. Religious leaders such as *Dai* (Muslim preacher) and priest ( Christian preacher).

The ultimate goal of the economic revitalization program, animal husbandary, is actually to create derivative products of the animals, such as manure from the urine and feces which can be used in the plantation. However, people are less informed about it. They still doing the farm and animal feeding as two separated activity.

### **Local Wisdom**

Basically, canal system has been done by the smallholders in a small scale for particular deep of peat. People call it *parit cacing*. They also have certain measurement for the canal, they use the length of the hoe as the measurement unit. It can be 2 hoe x 1 hoe. It is not a permanent canal. On the other hand, company establish bigger and permanent canal by using more precise measurement unit.

### **Logging activity**

In Kumpeh, logging activity is a common within the society. People tend to follow others who get instant cash from the logging activity. It is actually illegal. The amount of money people can get from logging activity is quite good around IDR 2.500.000 (for Meranti) to IDR 3.000.000 (for Puna) for every 10.000 cm<sup>3</sup> from sawmill. It will later turn to pieces of planks. The timbers

we saw floating on the river was from PT PDI, a logging company working in HP (*Hutan Produksi*/production forest).

### **Peatland Knowledge**

About 60 percent of the land managed by the society is peatland. Thus, society has been familiar with the peatland management base on their local wisdom. I #31 thinks that issue of peatland raise after the massive land fire last 2015. After the company entered the area digging up canals and clearing the land for plantation area. Massive canals establishment is bad for the peatland ecosystem.

Within the coastal area of West Tanjung Jabung which is peatland. The water level of the peatland is up and down affected by the tidal current. West Tanjung Jabung located 0 – 5 meter above the sea. Doing farming in this kind of area is challenging because farmers have to run after the flooding season. It is even worse lately because the flooding season is kind of unpredictable. It normally rains a lot between August to February but now it is not that precise.

Talking about the zero burning policy, it is a problematic policy. In fact, farmers cannot manage the land without fire because they cannot afford heavy machinery to work. It will take more than 1 week to manually clear the land. In practice, burning the land by smallholder does not lead to massive fire because farmers manage the fire carefully such as by having fire block and fire cover. In the future, there will be an innovative practice to reduce haze of the land fire by process it to be wood vinegar. There has been an idea from KPHP (*Kesatuan Pengolahan Hutan Produksi*/production forest management unit) to apply this process.

I #31 has been working in three different regencies including West Tanjung Jabung, East Tanjung Jabung and Muaro Jambi. Based on his experiences, he is thinking about planting araca nuts on his peatland. Araca nut can grow and adapted to the tidal current. In the dry season, the water level under the soil is about 40 – 50 cm. In the rain season, the water level is higher up to above the soil but only for some hours before it goes down again. He is thinking about having time to go to West Tanjung Jabung to find a good seedling for his araca nut plantation. However, the peatland has to be drained as well because it cannot grow well on swamp area.

### **Oil Palm**

I #31 thinks that people start to cultivate oil palm without proper knowledge about the commodity but the promising income of the oil palm. Oil palm is not peatland adapted commodity. Peatland commodity is actually food crops such as rice, corn and soybean. Oil palm was introduced to most of Kumpeh area around on 2000s. Apart from Mekar Sari which was in 1997. Mekar Sari was the first village in Kumpeh Iir cultivating oil palm. For Kumpeh Ulu, Ramin village was the first which start oil palm cultivation.

### **Community Assistance story**

Before BRG, there have been some NGOs came to Kumpeh. I #31 do his job by learning from the former NGO. He thinks that introducing and applying a program in the village is challenging because people have got different attitude toward the program. Some people are understand and aware about the aim of the program of BRG but some others do not. In particular, related to the aim of the BRG programs. In fact, BRG program is to deal with peatland restoration issue which brings benefit for people which is better environment.

However, some people only see the program as a source of income. Whenever they work for BRG running they will get paid. Thus, some people are kind of money oriented that they don't really aware the ultimate aim of the program.

### **Interview 25**

I#25 is our host family. He is very nice and helpful. We talked to him in at home in the evening . He is originally from Seponjen. His parent were also from the village. He graduated from senior high school. He has 1.5 ha of mineral land and 0.5 peatland covered with old rubber. The peat is not deep. The land is inherited from his parents. He is planning to plant araca nut and *jengkol* on his land.

### **NGO Programs**

I#25 often works with researchers from Jambi University. He also has been join in some NGO s ' program such as Walestra, ZSL (concerns about wildlife), and Gita Buana from 2013. They have programs funded by foreign donors to the villages. There was program of forest commodity seedling and land restoration. These three institutions work together on the programs.

There was also a program from MCAI from America coordinated with Gita Buana. It covered 6 villages including 3 villages in East Tanjung Jabung and 3 villages from Muaro Jambi. Seponjen, Gedong Karya, and Sungai Aur were those from Muaro Jambi. Baku Tuo, Cemara, and Air Hitam were those from East Tanjung Jabung. For the coastal area along East Tanjung Jabung the program was mangrove seedling to reduce the coast abrasion. MCAI had 20 Ha peatland restoration program, timber seedling including *Jelutung*, *Pulai Rawa*, and fruit trees which were *Duku*, *Durian* and *Manggis*. Not only forest commodity seedling for peatland, the program also support rice and corn farming for those who live around the peatland area.

Gita Buana offered the program then made the proposal. Once it is approved the aids will be distributed to the society. The program offered based on the idea of the villagers which was captured by conducted FGD with society. The FGD is conducted one in a month or once in two months. 30 % of the FGD participants are gender based, women.

Apart from NGO, BRG also has run some programs in the village such as Jelutung seedling. BRG cooperated with Jambi University lecturers/researchers. I#25 takes part in many village program because he is an active person. He likes to make friends. He is very helpful. Thus, he is trusted by many parties to be responsible to work on their projects. Basically, there are less people available to work for the projects. Thus, the recruitment is mostly based on the contribution of the people within discussion. People who contribute and proactive are mostly appointed.

Gita Buana came to the village and did discussion with the village stakeholder. I #25assisted them well then he was trusted to be leader of the project. There was compensation from the project for the runner. I #25said that working as the leader of the project is a significant job. He has to bridge the outsider to the locals.

### **Peatland**

Peatland change a lot due to the land fire. Soil degradation happens a lot. Within 1 year the soil can be degraded up to 10 cm if it is not replanted. In 10 years it will be 1 meter degraded. It is also prone to be flooded and dry. Last 2007 there was a long drought and land fire. Then in 2015 the fire got worse. In 2013 there was also land fire but it wasn't really bad. Currently some of the peatland has been planted with peatland commodity and intercrop commodity to preserve the peatland ecosystem.

There are some peatland projects from BRG conducted in Seponjen cooperated with Jambi University, including Jelutung planting. People of Seponjen welcome the program well. Thus, they have good relationships with those people from the program. The program has been running for 2 years. I #25also works as the group leader.

State electricity company (PLN) has a plan to establish a fire tower. It is still on the agreement process. The land fire exists in the company area but not yet in the society plantation. The main problem happens on the peatland is land fire. People also have to know the right commodity suitable to the peatland. Peatland has high level of acid. The acid level has to be reduced to be planted. Thus to manage peatland to be plantable a lot of cost is needed. To reduce the acid level farmers normally use Urea instead of Dolomit. Dolomit costs a lot of money.

The peatland in the village is ranging from 4 – 5 meters deep. The further from the housing resident it is the deeper. The peatland area is flat. In the Tahura the peat is 9 – 15 deep. I #25does not really well informed about the carbon emission. He thinks that the bigger the trees it will generate more carbon then it will reduce pollution.

### **Program Challenges**

One of the challenges faced by the program runner in the village is the perception gap. People do not well informed about the issue of natural fertilizer. Most of the people currently use chemical fertilizer as their main fertilizer. They think simple. They tend to do something fast and instant. When natural fertilizer making process introduced to them it is kind of challenging to change their mindset turning chemical to natural fertilizer. They would like to attend the workshop but somehow they expect to have some incentive to replace their working day. The program provides some snack for the participants. The workshop about the natural fertilizer making process conducted everyday. The program is lack of equipment provision and sort of funding. Most of the programs are not a long term programs. I #25thinks that there suppose to be a supervisor supervise the program.

### **BRG Program**

Cannal block is one of BRG program. There has been cannal block established close to the Tahura. The cannal block establish to preserve the water source at least 40 cm from the soil

surface. With the existence of canal block the water will remain in the canal in the dry season. Once the land fire occurs it will be easy to find water to get rid of the fire. Even though the fire occurs the soil will remain wet under the surface. The canal was built with spillway that the farmers can still use the canal to bring the FFB out of the field.

|  
#25 thinks that peatland restoration is not enough. Moreover in the Tahura place which covers 16,000 peatland. Apart from canal block it also has to be restored by planting more peatland trees. There are less huge trees in Tahura which will recover the peatland from destruction as the carbon sink. |

#25 does not really know about R1, R2, R3, but he has heard about it. He knows that economic revitalization is a small business such as animal breeding. Revegetation is replanting the peatland and to maintain the moisture of the peatland canal block is established. |

#25 thinks that these three programs are integrated. Restoration should increase the economic level of the people around otherwise when people still mainly concern on their economic problem, restoration will least possible to run well.

### **Interview 50**

Some hours after arriving in Gedong Karya, we spoke to a woman who attended the BRG training for manure making from Gedong Karya. Pak arief, our host, invited her to come to the back yard where we had picnic kind of :D then we had the interview.

#### **BRG Workshop**

There were 8 villages joined in the training including Gedong Karya, Aur Village, and some other villages within East and West Tanjung Jabung. There were 2 participants from each village. She was chosen to represent Gedong Aur village due to her availability. Most women in the village cannot leave home for quite long time, 5 days with overnight stay, because they have to take care of their family in particular their kids. She attended the training with Kurniawan. The training was conducted somewhere close to Pijoan, Muaro Jambi regency. The workshop was conducted on 5 – 8 of July 2019.

The training consisted of 2 days indoor discussion and 2 days field practice. She has got a certificate with whole lessons printed in the back. The idea was she supposed to be the trainer for field school in the village. The lessons were conducted for 36 hours which means 9 hours in a day, consist of :

Introduction to peatland,

Peatland management without burning

- Manure making
- Integrated farming in the peatland
- Harvest and after harvesting product management in the peatland
- Organization and social . . .

•

The manure was made from grass, cow dung, bran, and M4. It can be used after one month. She has been doing the manure process with Setiawan. They are thinking about transferring the knowledge to the society after they have been success to make it as an example.

She learned a lot in the training. The training changed her perception and practises on peatland. Previously she burned the land to clear the weeds. After the training, she does not burn the weed, she slashed them with chopping knife called *parang*, collects them and mince them to be process to natural fertilizer. She just knew it from the training. Today, people do not burn the land massively, they prefer to do manual weeding. They are afraid of the policy and also the danger of land burning. People in Gedong Karya has been quite well exposed to the land burning issues. The sosialization has been started after the land fire case in 2015. Gedong Karya has been one of Peatcare village (DPG/ Desa Peduli Gambut) in 2016.

### **Land fire**

The back yard where we has the interview was burned severely last 2015. After the land fire, it is told that many plants do not bear fruit such as cocoa and melon. Pak Arief said that it is because of the haze. Even after 2 years it was fruitless. After the fire, BRG and many Ngos came to the village to conduct peatland restouration program in particular for revegetation project. Mostly forest commodity such as timber trees including Jelutung, *jengkol* and other local trees. It replanted the lost forest due to the forest fire. The forest location is about 700 meters but the road is challenging. People said that we might get lost and could not find way home if we go there without a guide. Unfortunately, nobody could take us there.

From the replanting project, people get temporary income by doing the seedling. BRG pay them for doing the replanting. Later, people can take the fruits but not the timber. BRG was accepted well by BRG because society felt the benefit of the program.

### **Field Information**

She has both peat and mineral land. 1,5 ha of peatland and 0,25 ha of mineral land. It is 50 cm deep peat. She grows peanut and mugbean in between the young oil palm trees, about 2 years old. She got the peanut seeds from the department of agriculture distributed by Gita Buana. She is going to plant peanut again on October 2019. Peanut is harvested once in a year after 3 months of cultivation. For mugbean, it will harvested after 2 months of cultivation. She does the intercropping based on her previous experiences in Sumedang. She was a farmer.

### **Peatland**

Peatland is not easy to manage. People need to be well informed to manage the peatland. Currently, people have less knowledge about it. Ibuk said that people cannot do farming within the rain season. The main commodity in the village are oil palm and rubber. There are more rubber than oil palm. Rubber do not survive on the peatland. Oil palm can survive but it does not the fruit production is not good.

People are open to commodity change but they don't have idea about other commodity. They also worry about the cost. BRG has effort to make people change the commodity. BRG also

distributed some seeds like coffee and durian. However, those commodity cannot grow on peatland, pak arief think. One of the man thinks that there should be a research about peatland commodity. I told them that there have been actually research about it and there are hundreds list of commodity adapted to peatland ecosystem. He said that BRG does not really work farmers' peatlan but more for TAHURA land. People have no idea about coffee market. There was no follow up activity after giving the coffee seeds to the farmers.

### **Water Level**

BRG has installed a water level measurement machine in the village. The machine will update the water level in peatland to the BRG office later BRG stuff will check it. There is somebody in charge to take care of this machine.

When the peat is dry, pak arief thinks that it will be prone to be burn. People have to be careful of their smoke. Pak Arief knows this due to his own experience of burning the land by accident by ciggaretee. Luckily, he could put it out.

### **Interview 35**

Antoni is the secretary of Sogo Village. We met him at the office to introduce us and him if we could met the village head of Sogo. He was very helpful that he took us to the village head house. Later, after talking to the village head we came to his house to do interview. He lives in the village crossing the hanging bridge. Antoni is originally from Palembang, South Sumatra. He married to Sogo woman then he has been leaving at Sogo since 2000.

### **Paralegal**

Sogo village was selected as one of peatland care village (Desa Peduli Gambut/ DPG). BRG invited two representatives from each DPG to join trainings about paralegal issues. The training was conducted by BRG cooperated with MCAI (Millenium Challenge Account – Indonesia). The topic was mostly about law case in particular land conflicts which frequently happens in the village. The village head select the representative for the village. For Sogo, he and Pak Azwen were selected. The attended many trainings in Pekanbaru, Bogor, and also in Jakarta. Paralegal is a volunteering job. They are not paid by anyone however they have privilage to attend fully funded training from BRG.

Antoni has been invloved in a land conflict resolution together with the society. They have been moving to solve the case of PT BBS (*Bukit Bintang Sawit*) VS Sogo Village land conflict. It is a long process that they were working on together with WALHI. It is not easy at all to solve law case because there are multi-interests of multi-actors including government who hold power in everything. So for instant, 797Ha of land cultivated by PT BBS is owned by Sogo village. The resolution is improving but has not yet solved by this year.

### **BRG Training**

BRG conducted many programs. One of the programs is about creative industry, pandan weaving. There were two representatives from Sogo attended the workshop namely Ibuk Doyut and Ayu Ningsih. They were actually starting the small scale production in the village but they were stucked after producing it. They have no idea how to distribute them to the

market. Once, there was a negotiation between somebody in the village with a hotel in Jambi if they can supply the pandan leaves sandals as the hotel room sandals. However, they could not deal with the price. The hotel had too low price considering they currently use low cost material sandals. BRG also did workshop about environmental issues including local practise and cultural practises. Peatland knowledge also became one of the topic provided by BRG in some workshops.

### **Peatland Change**

Antoni thinks peatland problems such as land fire and water pollution occurs after company came. He said that before company came to the village, people use to burn the land as weeding practise. Land fire was not a problem then because they burned the land in small scale. Later, company open massive scale of land to be planted which lead to severe land fire. He thinks that the land fire was initiated by companies. Apart from the land fire, water pollution also become a problem. Chemical substances used by the company such as fertilizers and pesticide are discharged to the waterways. It contaminates the water and kills the water creatures such as shrimps and some kind of fish including *ikan Tapah* and *ikan belido*.

Before the company came to the village, the area which it is cultivated right now by the company were peat domes and deep peats. People used to take timber and fish in that area, however today they cannot do it any longer because it has been managed by the company. Thus, the fisherman move their territory which make them difficult to find fish. Those who do farming in that area move their farm to another plot because company took their plots. Normally farmers have more than one plots.

### **Peatland management**

People do paddy farming on the thin peatland area. The peat is 50 cm deep. It is apart from conflict area. Antoni said that timber trees such as Sengon and Pulai are suitable for peatland ecosystem. Once, forestry department has a project planting timber trees on the peatland area. However, it was severely burn last 2015 Now the project has started over again. He said that candle nut is also good to be cultivated on peatland area. He has no idea about paludi culture.

## SAFA Smallholders Survey

### Basic Information

1. Name of assessor:
2. Assessing organization:
3. Date of assessment:
4. Name of person being interviewed:
5. Gender of person being interviewed:
  - Female
  - Male
  
6. Is this person the farm owner?
  - Yes
  - No
  
7. Name of farm:
8. Village of farm:
9. Country of farm:
10. Does the interview take place on or close to the farm?
  - Yes
  - No
  
11. If you do know the GPS coordinates of your farm, please type them here:
12. OR Collect the GPS coordinates of the interview (function in the app)
13. Phone number of interviewee:
14. E-Mail of interviewee (if any):
  
15. What are the main crops and products that you produce? Main product 1:    Main product 6:  
Main product 2:    Main product 7:  
  
Main product 3:    Main product 8:  
  
Main product 4:    Main product 9:  
  
Main product 5:    Main product 10:
  
16. Which best describes your level of commercialization? (check all that apply)
  - I am a subsistence farmer
  - I sell mostly to local markets/customer
  - I am a fully commercialized farmer (sell goods mostly for export) farmer (with a company or a public-private partnership)  I
    - Yes
    - No
- 17.
18. Do you produce any livestock on your farm?
19. What is the size of the farm (local

units and preferably, in hectares)?

am a contract

Farmer

*Mission Explicitness*

1. Do you have a statement about the farm's goals and values that you follow and that everyone on your farm understands? [weight: 1]
  - Yes (green)
  - Partially (yellow)
  - No (red)

*Accountability*

2. Do you keep accurate records of your production processes (e.g., planting and harvesting information, input use) so they can be made available to producer organizations, customers or suppliers when required? [weight: 1]
  - Always or often (green)
  - Sometimes (yellow)
  - Never or rarely (red)

*Participation*

3. Do you belong to a producer organization (or another agriculturally focused organization)? [weight: 1]
  - a. Yes (green)
  - b. No (red)
4. How much value do you feel the farm receives from being a part of the organization? [weight: 1]
  - a. Significant value (green)
  - b. Some value (yellow) Little or no value (red)

*Conflict Resolution*

5. How often have you been able to peacefully and successfully resolve any problems or conflicts that you have experienced with your suppliers, workers, producer organization or buyers? [weight: 1]
  - Always or often (green)
  - Sometimes (yellow)
  - Never or rarely (red)
  - There have not been any problems or conflicts with other stakeholders (neutral)

*Sustainability Management Plan*

6. Do you have a farm management plan that provides for the success of your production in the long run? [weight: 1]
  - Yes (green)
  - No (red)
7. How successful has this plan been? [weight: 1]
  - Very successful (green)
  - Somewhat successful (yellow)
  - Not at all or limited success (red)

8. Which elements are part of your plan? [weight: 1]  
(green for 3 choices or more, yellow for 2 choices, red for 1 choice or less)

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Finances                  | <input type="checkbox"/> Expansion/Staff   | <input type="checkbox"/> Quality                    |
| <input type="checkbox"/> Soil fertility management | <input type="checkbox"/> Health and Safety | <input type="checkbox"/> Processing or adding value |
| <input type="checkbox"/> Environmental management  | <input type="checkbox"/> Marketing         | <input type="checkbox"/> Other                      |

*Profitability*

9. Do you produce crops, animals, or agricultural products for sale or trade? [weight: 2]  
 Yes (green)  
 No (red) – no go
10. Do you know your farm revenue for the last production year? [weight: 2]  
 Yes (green)  
 No (red)
11. Do you know your paid labour costs for the last production year? [weight: 1]  
 Yes (green)  
 No (red)  
 Not applicable (neutral)
12. Do you know your fertilizer, pesticide and seeds/plant material costs for the last production year? [weight: 1]  
 Yes (green)  
 No (red)  
 Not applicable (neutral)
13. Do you know your animal feed, veterinary care and juvenile stock costs for the last production year? [weight: 1]  
 Yes (green)  
 No (red)  
 Not applicable (neutral)
14. During the last five years, how often were farm revenues greater than costs? [weight: 1]  
 All or most of the time (green)  
 Some of the time (yellow)  
 Rarely/Never (red) – no go  
 I don't know (yellow)

*Product Diversification*

15. How many significant crops, products, or services are offered for sale? [weight: 1]  
 Three or more significant crops, products, or services (green)  
 Two significant crops, products, or services (yellow)  
 One significant crop or product (red)
16. Do you do any processing or value adding in order to increase revenue from services or the sale price of your crops or agricultural products (e.g., tourism, butchered meat, drying coffee or fruit, processing jam)? [weight: 1]  
 Yes (green)  
 No (yellow)

*Stability of Market*

17. How many buyers do you have for your significant crops or products? [weight: 1]
- I usually have multiple people or places to sell my product(s) to (green)
  - I usually have one or two people or places to sell my product(s) to (yellow)
  - I do not have a regular person or place to sell to (red)
18. How is your relationship with your most important buyer? [weight: 1]
- Very reliable and consistent (green)
  - Somewhat reliable and consistent (yellow)
  - Unreliable (red) – no go
19. Do you feel that you have a choice in where to sell your products? [weight: 1]
- Yes (green)
  - No (red)

*Fair pricing and transparent contracts*

20. Do you understand how buyer(s) calculate or establish prices paid? [weight: 1]
- Always or often (green)
  - Sometimes (yellow)
  - Never or rarely (red)
21. What type of market information did you know during the last production year? [weight: 1] Check all that apply (any of the first three answers gets a green score for the question):
- Prices paid by different buyers throughout the region for the same product
  - Price my buyer received for the product
  - Retail price of the product
  - None (red)

*Liquidity*

22. Check the sources from which you could realistically get a loan if you needed one: [weight: 1]  
(two or more of the first four answers is green, one is red)
- Informal sources such as friends, relatives, or religious groups
  - Banks, government lending institutions
  - Directly from buyers (exporter, importer, roaster, trader)
  - NGOs, cooperatives, farmer associations or microfinance group
  - My only option would be to ask a loan shark (red) – no go
23. If you requested a loan during the last year, how much did you receive compared to the amount that you requested? [weight: 1]
- All or most (green)  Some (yellow)
  - None (red) – no go
  - I did not request a loan during the last year (neutral)
24. Have you set aside savings? [weight: 1]
- Yes (green)
  - No (red)

*Safety Nets*

25. Do you have crop related insurance? [weight: 1]
- Yes (green)
  - No (red)
  - It is not available (yellow)
26. Do you have a risk management plan that accounts for minimum costs or support in case of harvest loss (e.g., community supported schemes, agreements with cooperatives)? [weight: 1]
- Yes (green)
  - No (red)
27. Have you implemented on-farm measures to reduce risk from variability in natural conditions and inputs (e.g. building a water tank)? [weight: 1]
- Yes (green)
  - Some (yellow)
  - No (red)

*Food Quality*

28. Do you take actions to maintain high quality in your crops and products (e.g. hygienic processing, proper storing and packaging, grading)? [weight: 1]
- Yes (green)
  - No (red)
29. During the last two years, have you had a technical quality assessment of any of your main crops or products? [weight: 1]
- Yes (green)
  - No (red)

*Certified Products*

30. Do you produce any crops, animals or products that meet, or are certified, to a standard? [weight: 1]
- Yes (green)
  - No (yellow)
  - I had a certification, but it was rescinded/taken away (red) – no go
31. How much of your main products or crops are sold as certified? [weight: 1]
- All or most (more than 80%) (green)
  - Some (40%-80%) (yellow)
  - Not much or none (less than 40%) (red)

*Legitimacy*

32. How do you ensure legal and regulatory compliance in general, including also any standard voluntarily entered into? [weight: 1]  
(green for 2 choices, yellow for 1 choice, red no choice)
- I use board agendas, other official records or notes of rights and compliances
  - I keep licences and permits, if required by law
  - I regularly report on compliance to auditors

*GHG Mitigation Practices*

**33.** Which statement best describes the current area covered by trees on your farm?

[weight: 1]

- About half or more of my farm is covered by trees (green)
- Less than half of my farm is covered by trees (yellow)
- I do not have any trees on my farm (red)

**34./35.** During the last production year was there any change to the number of trees on your farm? [weight: 1]

- Increase (include planting new trees from cuttings or from seed) (green)
- Decrease (removing focus crop trees, shade trees, natural forest trees, or other crop trees) (yellow)
- No change (green)

**36.** What is your main tillage method? [weight: 1 for both GHG and Land]

- Conventional (red)
- Reduced (yellow)
- No-till (green)

**37.** Does your farm consist mostly of ruminant production (e.g. cattle, goats, sheep)?

[weight: 1]

- Yes (red)
- No (green)

**38.** What is the main type of manure management system used on the farm? [weight: 1]

- Open-air lagoon or discharged into water bodies (red)
- Compost or biodigestion (green)
- Direct use (collected and spread on cropping area, left on pasture) (yellow)

*Air Pollution Prevention Practices*

**39.** Do you use a smokeless fuel or chimney to vent smoke when cooking? [weight: 1]

- Yes (green)
- No (red)

**40.** Do you ever burn your fields? [weight: 1 for both Air pollution and Species conservation]

- Yes (red)
- No (green)

*Soil Improvement Practices*

**41.** What is the main type of fertilizer used on the farm? [weight: 1 for GHG and Soil]

- Natural fertilizers applied according to crop and soil needs (green for GHG and Soil)
- Natural fertilizers applied without knowledge of crop or soil needs (yellow for GHG and green for Soil)
- A combination of natural and synthetic fertilizers (yellow for GHG and Soil)
- Synthetic fertilizers applied according to crop and soil needs (yellow for GHG and Soil)
- Synthetic fertilizers applied without knowledge of crop or soil needs (red for GHG and yellow for Soil)

- None (green for GHG and red for Soil)

42. Which of the following are used to improve soil fertility on the farm?

[weight: 1] two or more of the first four answers is green, one is yellow

- Cover crops
- Nitrogen fixing annual or perennial plants
- Intercropping
- Crop rotation for maintaining soil health
- None (red)

*Nutrient Balance*

43. How do you determine how much fertilizer (synthetic or natural) to apply to your crop(s)? [weight: 1]

- We apply fertilizer based on a careful assessment of our soil and crops (including farmer observation, professional tests, or analyses) (green)
- We apply fertilizer based on general advice for the region or for our crop(s) (yellow)
- We are not able to fertilize (red)
- We do not use enough fertilizer, but we apply as much as we can afford (yellow)

*Land Conservation and Rehabilitation Practices*

44. Which of the following are ways that you manage your soil?

[weight: 1] (two or more of the first three answers is green, one is yellow)

- Maintain a permanent soil cover through mulch, planted soil cover, etc.
- Terracing or contour planting on areas of significant slope
- Hedgerows (e.g., trees and shrubs)
- Soils are often bare between cropping cycles (red)

*Hazardous Pesticides*

45. Do you use any synthetic (chemical) pesticides on your farm? [weight: 1 for Pesticides and Water pollution]

- Yes (red)
- Only occasionally (yellow)
- No (green)

46. Do any of the synthetic pesticides used on your farm have a red band around the container or on the label? [weight: 1]

- Yes (red) – no go
- No (neutral)

47. Do the pesticides used on your farm have labels that you understand? [weight: 1]

- Yes, they all have labels with instructions on dosage, safety, etc. that I understand (green)
- Some do not have readable labels (or are unlabelled) (red) – no go

48. Do you ever mix pesticides? [weight: 1]

- Yes (red) – no go
- No (green)

*Ecosystem Diversity*

49. Did you convert any natural land (prairie, forest, or savannah) to production land during the last five years? [weight: 2 for Ecosystem diversity and weight: 1 for Land]
- Yes (red)
  - No, there is no natural land on the farm (neutral)
  - No, natural land on the farm was left as is (green)

*Species Conservation Practices*

50. Do you have any of the following on your farm to preserve or restore natural species? [weight: 1]  
(two or more of the first three answers is green, one is yellow)
- Permanent set-aside (land taken out of production to create a habitat for biodiversity)
  - Rehabilitated or restored natural areas
  - Hedgerows or buffer zones
  - None (red)
51. Check all of the pest and disease management practices used for the main crop(s) during the last production year: [weight: 1 for both Species conservation and Hazardous pesticides] (All four first choices should be marked for green, yellow if only some are marked)
- Conduct regular visual examinations of plants to detect pests or disease
  - Use traps, repellents (including repellent species), and natural pesticides
  - Create or preserve places (including plant species) for beneficial predators of pests to live
  - Maintain written record of pest infestation, treatments, and results
  - I use synthetic pesticides specific to the crop and/or pest at the proper dosage and timing (yellow)
  - I apply synthetic pesticides preventatively (e.g., on a regular schedule regardless of whether a pest or disease threat currently exists) (red)
52. Which statement best describes the diversity of your farming system? [weight: 1]
- I produce multiple (4+) types of crops and/or livestock in the same area (green)
  - I produce 2-3 types of crops and/or livestock in the same area (yellow)
  - The majority of my farm is used to produce a single crop or one type of livestock (red)

*Saving Seeds and Breeds*

53. For the main crops and livestock produced on the farm, do you use any locally adapted varieties of seeds or breeds? [weight: 2]
- Yes (green)
  - No (red)
54. What is the main source of your seeds or breeds? [weight: 1]
- Saved by the farmer, obtained from neighbours, or from a local seed bank (or breeding program for livestock) (green)
  - A combination of local and non-local sources (yellow)
  - Completely reliant on external non-local sources (red)

*Water Conservation Practices*

55. Do you use water conservation practices on the farm? [weight: 1]
- Yes (green)
  - No (red)
  - Sometimes (yellow)
56. Do you irrigate your crops? [weight: 1]
- Yes (neutral)
  - No (green)
57. What form of irrigation do you use? [weight: 1]
- Manual irrigation (hand watering) (yellow)
  - Surface irrigation (red)
  - Drip irrigation (green)

*Water Pollution Prevention Practices*

58. Which of the following statements apply to your farm? [weight: 1]
- The land I use for cultivating crops and/or for pasturing animals is directly next to natural waterways (red)
  - Pesticide application equipment is cleaned in natural water bodies (red)
  - Untreated domestic or processing water is discharged into natural water bodies (red) " None (green)

*Renewable and Recycled Materials*

59. How do you manage crop residues, processing residues, and organic matter? [weight: 2]
- Reused (e.g., through compost, as a soil cover, animal feed, biofuel or other uses) (green)
  - Burned or discharged into waterways (red)
  - Left in piles or taken off farm (yellow)
60. Do you recycle or reuse metal, plastic containers or bags (with the exception of agrochemical containers), paper or cardboard? [weight: 1]
- Yes (green)
  - No (red)
  - Not applicable (neutral)

*Energy Use/Energy consumption/Renewable energy*

61. If you use electricity, charcoal, wood, or fuel sources of energy, are you improving your efficiency? [weight: 1]
- I can demonstrate that I reduce energy use (e.g., through fuel efficient stoves, solar drying, well-maintained machinery, switching from wood to gas) (green)
  - I have made some efforts to reduce energy, but I have not applied them to most of my farm (yellow) | I do not make any attempts to reduce energy (red)
62. If you used wood or charcoal for energy during the last production year, what was the main source? [weight: 1]
- Purchased, I don't know (yellow)
  - Managed natural forest with limited extraction (green)

- Unlimited forest use (red)
  
  - Managed plantations or planted woodlots (green)
  - Tree pruning (green)
  - Not applicable, I do not use wood or charcoal energy (neutral)
63. Do you use any of the following renewable energy sources for a significant portion of your energy needs? [weight: 1] (any green answer gets a green for the indicator)
- Solar (green)
  - Hydropower or geothermal (green)
  - Wind (green)
  - Biofuel from farm or household waste (green)
  - None of the above (yellow)

*Food Loss and Waste Reduction*

64. Which of the following best describes your pre- and post-harvest losses (i.e., the amount of crop lost during production, storage, and transport) during the last production year? [weight: 1]
- Minimal (less than 10%) (green)
  - Some (10-30%) (yellow)
  - Substantial (more than 30%) (red)
65. Do you take active steps to reduce pre- and post-harvest losses on your farm (through improving storage and transport methods, pest/disease management, harvesting at the appropriate time, etc.) [weight: 1]
- Yes (green)
  - No (red)

*Animal Health and Welfare*

66. Do you have access to veterinary care for the livestock on your farm? [weight: 1]
- I do not have access (red)
  - I have access, but it is problematic (unqualified personnel, too costly, too distant, or it is inhumane) (yellow)
  - I have access to veterinary services that are of good quality, affordable, and nearby (green)
67. Which statement best describes the way livestock diseases are managed on the farm? [weight: 1]
- I give animals medication routinely to prevent them from becoming sick (red)
  - I follow my veterinarian or a local expert's recommendation for the treatment of diagnosed diseases (green)
  
  - I do not consult professionals or experts about animal diseases (yellow)
  - I do not provide my livestock with any veterinary care (red)

68. Which of the following most accurately reflects the general state of well-being and living conditions of animals on the farm? [weight: 1]
- I practice animal husbandry that provides animals with adequate space, shelter that is kept clean and does not crowd animals, a sufficient and balanced diet, and I prevent unnecessary distress (green)
  - Animals have adequate living conditions, sufficient feed, and I try to prevent unnecessary distress, but there is room for improvement (yellow)
  - Animals are kept in unsanitary or inadequate shelter conditions, are limited in expressing natural behaviours, do not have access to adequate feed, or measures are not taken to keep animals from experiencing unnecessary distress (red) – no go

*Safety of Workplace, Operations and Facilities*

69. How long must you travel to reach medical care (nurse, doctor, or clinic) using the most common transportation method? [weight: 1]
- Treatment at farm or under 1 hour (green)
  - 1 to 3 hours (yellow)
  - More than 3 hours (red) – no go
70. How affordable is the nearest medical care for the farm's household members and workers? [weight: 1]
- Treatment is free, or costs are low and do not cause difficulty (green)
  - Costs are difficult, but not so high as to keep household members and workers from obtaining treatment when needed (yellow)
  - Costs are so high that household members or workers avoid treatment even for very serious conditions (red) – no go
71. How long must people on the farm travel to reach water they consider safe to drink? [weight: 1]
- Water is available on site, or is 5 minutes or less away (green)
  - More than 5 minutes, but less than 20 (yellow)
  - More than 20 minutes (red) – no go
72. Do members of your household and others who live on your farm have consistent access to sufficient and adequate water for human use (i.e., for water intake, hygiene, and cooking needs)? (As a reference point, 15 litres per person per day is generally considered adequate) [weight: 1]
- Yes (green)
  - Most of the time (yellow)
  - No (red)
73. Do any of the following apply pesticides on the farm? [weight: 1]
- Pregnant women (red)
  - People under 18 (red)
  - People untrained in pesticide application (red)
  - None of these groups apply pesticides on the farm (green)

74. What protective equipment is used when synthetic pesticides are applied?  
[weight: 1] (All 4 answers must be marked for green, yellow for some)
- Plastic or rubber gloves
  - Breathing masks (not just handkerchiefs)
  - Protective outer clothing (should cover body with impermeable material)
  - Protective foot gear (rubber or plastic boots)
  - None (red) – no go
75. Did you have more than one serious injury on your farm during the last year (enough to require medical attention)? [weight: 1]
- Yes (red)
  - No (green)
76. How well are you prepared to avoid risks on the farm and to handle emergencies?  
[weight: 1]  
(All 3 answers must be marked for green, yellow for two, red for one or none)
- I have first aid kits on the farm (e.g. bandages, antiseptics)
  - I warn my employees of potential hazards on the farm and how to handle them (e.g. snake bites)
  - I properly store dangerous tools and well maintain machinery

*Capacity Development*

77. What type of training(s) did you attend during the last year? (Training is considered to be a half-day or more)  
[weight: 1]
- (three or more types of training is green, one or two is yellow)
- Improving farming operations (agricultural practices or processing practices)
  - Improving record keeping (on farming operations traceability and book keeping)
  - Marketing support (information and education about topics such as prices, market contacts)
  - Health and safety issues
  - Environmental issues
  - Adult literacy
  - Managing the farm's business or finances
  - Other
  - I did not participate in training (red)

*Paid Labour*

78. Do you hire paid labor? [trigger question, not rated]
- Yes
  - No

*Employment relations*

79. Would you be willing to hire workers of different social groups (e.g. ethnic/religious minorities) at the same wage rate of a local man of the dominant ethnicity and religion? [weight: 1]
- Always or often (green)
  - Sometimes (yellow)
  - Never or rarely (red) – no go
  - Not applicable (neutral)

*Freedom of Association and Right to Bargaining*

80. Are hired workers free to associate with colleagues or unions and do they have the right to bargain their employment conditions? [weight: 1]
- Definitely do (green)
  - Sometimes (yellow)
  - Definitely don't (red)

*Forced Labour*

81. Are hired workers free to leave their employment at any time, with reasonable notice and in accordance with working agreement (formal or informal)? [weight: 1]
- Yes (green)
  - At a price (e.g. penalty, non-payment of wage, loss of privileges) (red)

*Child labour*

82. Which of the following statements apply to children younger than 16 years working on the farm (whether or not they are paid)? [weight: 1]
- Children work on the farm with family in a way that allows them to attend school (work less than 20 hours a week) (green)
  - Children work on the farm instead of going to school (work more than 20 hours a week) (red) ; Children do not work on the farm (green)

*Non-discrimination*

83. In case of harassment or discrimination amongst your employees (e.g. sexual harassment of women), how would you respond? [weight: 1]
- I am comfortable implementing a procedure to protect vulnerable groups (green)
  - I do not have a plan or procedure, but I would take action (yellow)
  - I would not personally take action (red)

*Gender equality*

84. Are both men and women active on the farm? [trigger question, not rated]
- Yes (neutral) ; No (neutral)
85. What portion of the decisions about the farm's significant crops/products are made by men on the farm? [weight: 1]
- All or most (red)

- About half (green) ; Few or none (red)
- 86. What portion of the decisions about the farm's significant crops/products are made by women on the farm? [weight: 1]
  - All or most (red)
  - About half (green)
  - Few or none (red)
- 87. Do girls and boys on the farm have the same educational opportunities? [weight: 1]
  - Yes (green)
  - No (red)
  - Not applicable, there are no children on the farm (neutral)
- 88. Do men and women on the farm have the same training opportunities? [weight: 1]
  - Yes (green)
  - No (red)

*Regional workforce*

- 89. If you hire labour, what is the main source of your workers? [weight: 1]
  - I hire mostly workers from the local community (green)
  - I hire mostly migrant workers or workers from outside my local community (red)
  - I hire workers from the local community and also migrants or those outside of my community (yellow)
  - I tried to hire local workers but was unable to do so, due to circumstances that did not depend on me (yellow) ; Not applicable (neutral)

*Food Sovereignty*

- 90. How much do you agree with the following statement: I have the option to choose to produce the crops and products that I want to on my farm? [weight: 1]
  - Agree (green)
  - Neither agree or disagree (yellow)
  - Disagree (red)
- 91. Do all members of the household have access, every day, to adequate nutrition in a culturally appropriate and satisfying way? [weight: 1]
  - Yes (green)
  - No (neutral)
- 92. How many days during the last production year did any member of the family cut the size of meals or skip meals because there wasn't enough food? [weight: 1]
  - 1-9 days (yellow)
  - 10-29 days (red)
  - 30 or more days (red) – no go

*Indigenous knowledge*

- 93. Do you consider that your product has a higher value-added thanks to traditional/indigenous knowledge? [trigger question, not rated]
  - Yes (neutral) ; No (neutral)

94. Do you have a connection with the community where the traditional/indigenous knowledge has originated from?

[weight: 1]

- I am a part of the community myself (green)
- Formal link with sharing of benefits (e.g. royalties or sharing profits) (green)
- Informal link to ensure the preservation of knowledge (yellow)
- No link established (red)

*Tenure rights*

95. Do you feel secure with your tenure? [weight: 1]

- Yes (green)
- Somewhat (yellow)
- No (red)

96. Are there practices or investments you would like to implement on your farm but cannot because of tenure constraints? [weight: 1]

- Yes (green)
- Possibly (yellow)
- No (red)

*Community Investment*

97. Do you participate in any community welfare projects (e.g., building community facilities, roads, schools, clinics, water works; organizing youth activities; or donating food or produce to community events), or do you undertake activities that have direct benefits for your community (e.g., managing a shared forest, building ponds for water management)? [weight: 1]

- Yes, I regularly participate in or organize projects that benefit my community (green)
- I am aware of projects like these in my community, and I participate in them occasionally (yellow) ; I do not participate in community welfare projects (red)

*Quality of Life*

98. What is your opinion of the overall quality of life (e.g. in terms of time, money and lifestyle) on the farm compared to the previous year? [weight: 1]

- Good (green)
- Not good, not bad (yellow)
- Bad (red)

*Wage level*

99. Which of the following can you afford comfortably based on your income, without compromising time for weekly rest and holidays? [weight: 1]  
(green for all selected, yellow for 5 to 8 choices, red for 4 choices or less)

- Three meals a day for myself and my family that include fruits and vegetables, and meat if I choose to eat it
- Appropriate clothing for myself and my family including shoes, clean clothes for school or work, warm clothes in winter, etc
- Medical care, including visits to doctors for myself and my family, and prescriptions or medications
- Educational expenses for children including school fees, uniforms, books and transportation
- Sufficient clean drinking water in my home
- Access to safe means of transportation
- Housing that is safe and protects from the weather
- Energy expenses that allow light and adequate heating or cooling (such as fans or heaters), when necessary
- Savings of at least 10% of my income to set aside for cultural or recreational activities and other expenses

100. Which of the following can your employees afford comfortably, based on the wage rate that you pay them, without having to have a second source of income? [weight: 1] (green for all selected, yellow for 5 to 8 choices, red for 4 choices or less)

- Three meals a day for themselves and their family that include fruits and vegetables, and meat if they choose to eat it
- Appropriate clothing for themselves and their families including shoes, clean clothes for school or work, warm clothes in winter, etc
- Medical care, including visits to doctors for themselves and their families, and prescriptions or medications
- Educational expenses for children including school fees, uniforms, books and transportation
- Sufficient clean drinking water in their homes
- Access to safe means of transportation
- Housing that is safe and protects from the weather
- Energy expenses that allow light and adequate heating or cooling (such as fans or heaters), when necessary
- Savings of at least 10% of their income to set aside for cultural or recreational activities and other expenses

*Legend*

- multiple answer options
- only one answer option per question









**STATUTORY DECLARATION**

I, Jasper Knieling, herewith declare that I am the sole author of the enclosed master thesis with the title Smallholder perceptions of sustainability criteria related to forest and peatland restoration “”. All references and data sources that were used in the thesis have been appropriately acknowledged. Any thoughts from others or literal quotations are marked. Furthermore, the enclosed master thesis in this or any other form has not been submitted to achieve an academic degree at any other university or institution and has not been published.

Göttingen, 19.01.2020

(Jasper Knieling)